CHAPTER 11

Battery and Electrical Systems

SPECIFICATIONS 11.2
ENGINE MODELS 11.2
SPARK PLUGS 11.2
CHARGING SYSTEM 11.2
IGNITION TIMING 11.2
FRESH PACK BATTERY 11.3
BATTERY PREPARATION 11.3
SPECIFICATIONS 11.3
SEALED BATTERY 11.3
SPECIFICATIONS 11.3
BATTERY TESTING 11.3
TESTING PROCEDURES 11.3
OPEN CIRCUIT VOLTAGE TEST (OCV) 11.3
LOAD TEST 11.3
BATTERY CONDUCTANCE ANALYZER 11.4
OFF SEASON STORAGE 11.4
IGNITION TIMING 11.5
TIMING PROCEDURE - CARBURETED ENGINES 11.5
TIMING PROCEDURE - CFI ENGINES 11.5
IGNITION TIMING CHART 11.6
ELECTRIC START - IQ CARBURETED / CFI 11.7
CFI / DC-CFI ELECTRICAL SYSTEMS 11.13
CFI STATOR ASSEMBLY 11.13
DC-CFI STATOR ASSEMBLY 11.14
CFI / DC-CFI CHASSIS POWER CAPACITOR 11.15
CFI DC REGULATOR / RECTIFIER 11.15
DC-CFI DC REGULATOR / RECTIFIER 11.15
CFI REGULATOR/RECTIFIER DIODE TESTING 11.16
OVER-VOLTAGE/VOLTAGE SPIKE TEST 11.17
DC-CFI AC REGULATOR/BATTERY CHARGE RECTIFIER 11.18
CFI CHASSIS RELAY 11.19
DC-CFI REGULATED (RED) POWER CIRCUITS 11.20
600 IQ WIDETRAK REGULATED (RED) POWER CIRCUITS 11.21
DC-CFI/600 IQ WIDETRAK CHASSIS (RED/WHITE) POWER CIRCUITS 11.22
600 IQ WIDETRAK BRAKE/FAN RELAY CONTROL 11.23
DC-CFI AC POWER (LIGHTING) CIRCUITS 11.24
600 IQ WIDETRAK AC POWER (LIGHTING) CIRCUITS 11.25
CFI THROTTLE / IGNITION KILL SYSTEM 11.26
DC-CFI/600 IQ WIDETRAK THROTTLE / IGNITION KILL SYSTEM 11.27
CFI/DC-CFI VEHICLE SPEED SENSOR 11.28
600 IQ WIDETRAK VEHICLE SPEED SENSOR 11.28
CARBURETED ELECTRICAL SYSTEMS 11.29
DETONATION CONTROL (DET) 11.33
OVERVIEW 11.33
VARIABLE EXHAUST SYSTEM (VES) 11.33
OVERVIEW 11.33
DIAGNOSTIC PLUGS 11.34
CARBURETED / CFI CHASSIS POWER PLUG 11.34
DC-CFI DC POWER TEST PLUG 11.34
CFI / DC-CFI FUEL PUMP PRIME PLUG 11.34
ELECTRONIC REVERSE (PERC) 11.35

9922854 - 2007-2011 IQ Service Manual
©2010 Polaris Sales Inc.

SPECIFICATIONS

Engine Models

Model Number	Engine
EC55PM120/121/122	Fuji 550cc Fan
S3273-6044-PF6F S3274-6044-PF6F S3466-6044-PU6F S3467-6044-PU6F	Liberty 600cc HO Carbureted
S3206-6044-PF6H S3468-6044-PU6H S3469-6044-PU6H S3996-6044-OP6H S4176-6044-OP6H S4177-6044-OP6H S4203-6044-OP6M S4217-6044-OO6H S4216-6044-OO6H S4219-6044-OO6N S4218-6044-OO6H	Liberty 600cc CFI
S3305-7044-PF7J S3322-7044-PF7J S3470-7044-PU7J S3471-7044-PU7J S4175-7044-OP7J	Liberty 700cc CFI
S3489-8044-PU8E S3471-8044-PU8E S4001-8044-OP8E S4004-8044-OP8E	Liberty 800cc CFI

Spark Plugs

Model	Spark Plug	Gap (Inches / mm)
Liberty Engines Standard Optional	Champion RN57YCC NGK BPR9ES	.025 / 0.70
Fuji 550cc Fan	NGK BR9ES	.028 / .70

Charging System

Model	Stator Output	# of Pulses
Fuji 550cc Fan	280W	6
ALL 600 CARBURETED	280W	6
ALL 600/700/800 CFI	400W	N/A

Ignition Timing

Model	Specification
Fuji 550cc Fan	26° @ 4500 RPM 17° @ 6500 RPM
ALL 600 CARBURETED	26° @ 3500 RPM (Disconnect TPS)
ALL 600/700/800 CFI	18° @ Idle (1700 RPM)/120° Engine Coolant Temperature

⚠ WARNING

PROPOSITION 65 WARNING

BATTERY POSTS, TERMINALS, AND RELATED ACCESSORIES CONTAIN LEAD AND LEAD COMPOUNDS, CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND REPRODUCTIVE HARM. WASH HANDS AFTER HANDLING.

BATTERY ELECTROLYTE IS POISONOUS. IT CONTAINS ACID!

SERIOUS BURNS CAN RESULT FROM CONTACT WITH THE SKIN, EYES, OR CLOTHING

.

ANTIDOTE:

EXTERNAL: FLUSH WITH WATER.

INTERNAL: DRINK LARGE QUANTITIES OF WATER OR MILK. FOLLOW WITH MILK OF MAGNESIA, BEATEN EGG, OR VEGETABLE OIL. CALL PHYSICIAN IMMEDIATELY.

EYES: FLUSH WITH WATER FOR 15 MINUTES AND GET PROMPT MEDICAL ATTENTION.

BATTERIES PRODUCE EXPLOSIVE GASES. KEEP SPARKS, FLAME, CIGARETTES, ETC. AWAY. VENTILATE WHEN CHARGING OR USING IN CLOSED SPACE. ALWAYS SHIELD EYES WHEN WORKING NEAR BATTERIES.

KEEP OUT OF REACH OF CHILDREN.

©2010 Polaris Sales Inc.

FRESH PACK BATTERY

NOTE: Do not service the battery unless it will be put into regular service within 30 days.

Battery Preparation

Some models are equipped with a fresh pack battery. These batteries require filling with electrolyte and a full charge prior to service.

1. Fill battery with electrolyte to the upper level marks on the case.
2. Set battery aside and allow it to cool and stabilize for at least 30 minutes.
3. Add electrolyte to bring the level back to the upper level mark on the case.

NOTE: This is the last time that electrolyte should be added.

4. Charge battery at 1/10 of its amp/hour rating. Example:1/10 of 9 amp battery =.9 amps, 1/10 of 14 amp battery = 1.4 amps, 1/10 of 18 amp battery = 1.8 amps (recommended charging rates).
5. Check specific gravity of each cell with a hydrometer to ensure each has a reading of 1.270 or higher.
6. Install vent cover.

NOTE: Once the vent cover is installed, the battery is sealed. Do not remove the cover.

Specifications

Battery PN 4010905

Battery Type	YTX14AH-BS-Fresh Pack
Nominal Capacity	12VDC / 12AH
Electrolyte Volume	22.3oz.
Specific Gravity	1.320
CCA @ 0F (-18C)	210 AMPS
Charging Current	1.2 AMPS

SEALED BATTERY

Specifications

Battery PN 4010466

Battery Type	Polaris Maintenance Free
Nominal Capacity	12 VDC 18 AH @ 10 hour Rate
CCA @ 0F (-18C)	270 AMPS
Charging Current	1.8A x 5-10 Hours

Battery PN 4011224

Battery Type	Polaris Maintenance Free
Nominal Capacity	12 VDC 14 AH @ 10 hour Rate
CCA @ 0F (-18C)	365 AMPS
Charging Current	6 AMPS Maximum

BATTERY TESTING

Testing Procedures

Batteries should be kept at or as near full charge as possible. If the battery is stored or used in a partially charged condition, hard crystal sulfication will form on the plates, reducing their efficiency and possibly ruining the battery.

Open Circuit Voltage Test (OCV)

Check static battery voltage with multimeter. Voltage should be no less than 12.8 VDC. Charge battery if voltage is lower than 12.8 VDC.

Load Test

A battery may pass the OCV test, but still not have the storage capacity necessary to properly function.

1. Connect multimeter to the battery as if performing the OCV test.
2. Turn the engine over using the electric starter.
3. Replace battery if VDC drops below 9.5VDC.

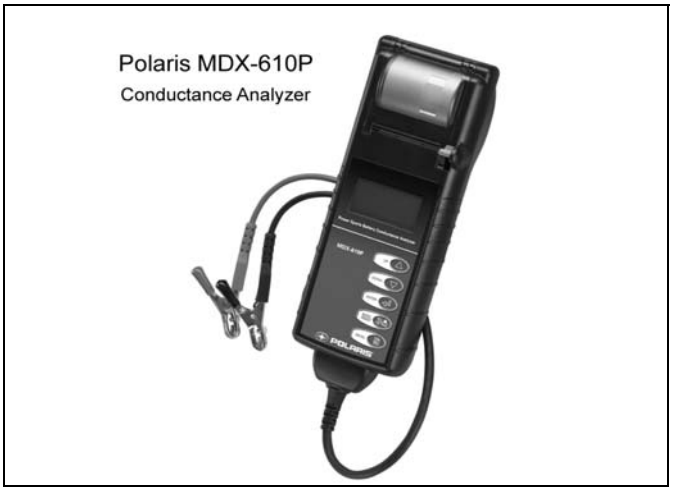
NOTE: Battery load test tools can be purchased commercially. Follow the manufactures' instructions for use.

9922854 - 2007-2011 IQ Service Manual
©2010 Polaris Sales Inc.

Battery Conductance Analyzer

Conductance describes the ability of a battery to conduct current. A conductance tester functions by sending a low frequency AC signal through the battery and a portion of the current response is captured, from this output a conductance measurement is calculated. Conductance testing is more accurate than voltage, specific gravity, or load testing.

Authorized Polaris dealers/distributors are required to use the conductance analyzer when testing 12V Polaris batteries.



Polaris MDX-610P
SPX PN: PU-50296

Off Season Storage

To prevent battery damage during extended periods of non-use, the following maintenance items must be performed.

1. Remove battery from machine and wash the case and battery tray with a mild solution of baking soda and water. Rinse with of fresh water after cleaning.

⚠ CAUTION

DO NOT ALLOW ANY OF THE BAKING SODA SOLUTION TO ENTER THE BATTERY OR THE ACID WILL BE NEUTRALIZED.

2. Using a wire brush or knife, remove any corrosion from the cables and terminals.
3. Charge at a rate no greater than 1/10 of the battery's amp/hr. capacity.
4. Store the battery in a cool, dry place.

NOTE: Stored batteries lose their charge at the rate of 1% per day. They should be fully recharged every 30 to 60 days during a non-use period. If stored during winter months, the electrolyte will freeze at higher temperatures as the battery discharges.

Specific Gravity Freezing Point

Specific Gravity of Electrolyte	Freezing Point
1.265	-75°F (-59°C)
1.225	-35°F (-37°C)
1.200	-17°F (-27°C)
1.150	5°F (-15°C)
1.100	18°F (-8°C)
1.050	27°F (-3°C)

9922854 - 2007-2011 IQ Service Manual
©2010 Polaris Sales Inc.

IGNITION TIMING

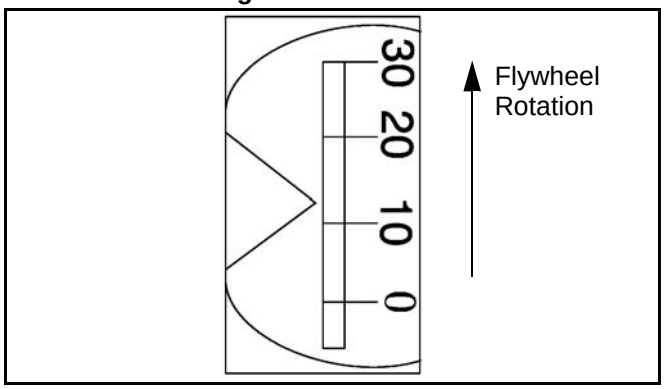
Timing Procedure - Carbureted Engines

NOTE: Always verify timing of engine at room temperature (68°F / 20°C), and at the specified RPM. If applicable, make sure the key switch is in the PREMIUM mode and the TPS is unplugged.

1. Reference the timing specification chart.
2. Install a dial indicator gauge into the MAG spark plug hole.
3. Place the MAG piston in the proper timing position, then mark the flywheel at this point.

EXAMPLE: 600 HO Carbureted = 26° @ 3500RPM. Place the MAG piston 4.0096mm (0.1579in.) BTDC.

NOTE: Each 10 degree mark is separated by lines every 2 degrees (not shown). Acceptable timing variance is +/- 2 degrees.



4. Connect an accurate tachometer and a good quality timing light to the engine according to manufacturer's instructions.
5. Disconnect the throttle position sensor (TPS), if equipped.
6. Start engine and increase RPM to the point specified in the timing specifications. Hold the throttle to maintain specified timing RPM.
7. Point the timing light at the timing inspection hole.
8. With your head positioned so there is a straight line between your eye, the stationary pointer and the crankshaft center line, note the relative position between the marked flywheel line and the pointer. If the stationary pointer is aligned with the mark made in Step 3, or within the acceptable variance, ignition timing is correct.
9. If the pointer is outside the variance, the stator will have to be rotated either with crankshaft rotation (to retard the timing) or against rotation to advance it.

NOTE: Rotate stator plate approximately the same distance as the marks must move. In most cases, the recoil starter housing, recoil drive hub, and flywheel must be removed to loosen the stator bolts and change the timing. On some engines, the stator plate retaining screws can be accessed through the flywheel.

10. Torque stator plate screws and flywheel nut to specified torque. Apply Loctite 262 (red) to crankshaft flywheel taper if required. Refer to the Specifications section for torque specifications and flywheel installation procedure for engine type.

Timing Procedure - CFI Engines

NOTE: Before performing procedure, verify there are no current trouble codes and that all of the engine electrical connections are clean and tight.

1. Reference the timing specification chart and locate the piston BTDC measurement for 18°.
2. Install a dial indicator gauge into the MAG spark plug hole.
3. Place the MAG piston at 18° BTDC. Mark the flywheel.

NOTE: Each 10 degree mark is separated by lines every 2 degree. Acceptable timing variance is +/- 2 degrees.

4. Connect a good quality timing light to the engine according to manufacturer's instructions.
5. Start and run the engine at idle speed until the engine temperature is 120°F (49°C). Verify the throttle lever is closed and the engine is at idle speed (1700 +/- 100 RPM).

NOTE: The engine temperature must be approximately 120°F (49°C) to obtain accurate timing specification. Use the MFD digital temperature display to view engine temperature.

6. Point the timing light at the timing inspection hole.
7. With your head positioned so there is a straight line between your eye, the stationary pointer and the crankshaft center line, note the relative position between the marked flywheel line and the pointer. If the stationary pointer is aligned with the mark made in Step 3, or within the acceptable variance, ignition timing is correct.

NOTE: The stator plate, two-tooth, and five-tooth crankshaft position sensor locations are not adjustable.

8. If the pointer is outside the variance, either the flywheel key has sheared allowing the flywheel to move on the crankshaft, the crankshaft is out of index, a problem with the engine electrical harness exists, or one of the crankshaft position sensors has moved.

©2010 Polaris Sales Inc.

Ignition Timing Chart

Convert the ignition timing specification from degrees BTDC to either inches or millimeters, then use a dial indicator to verify timing marks.

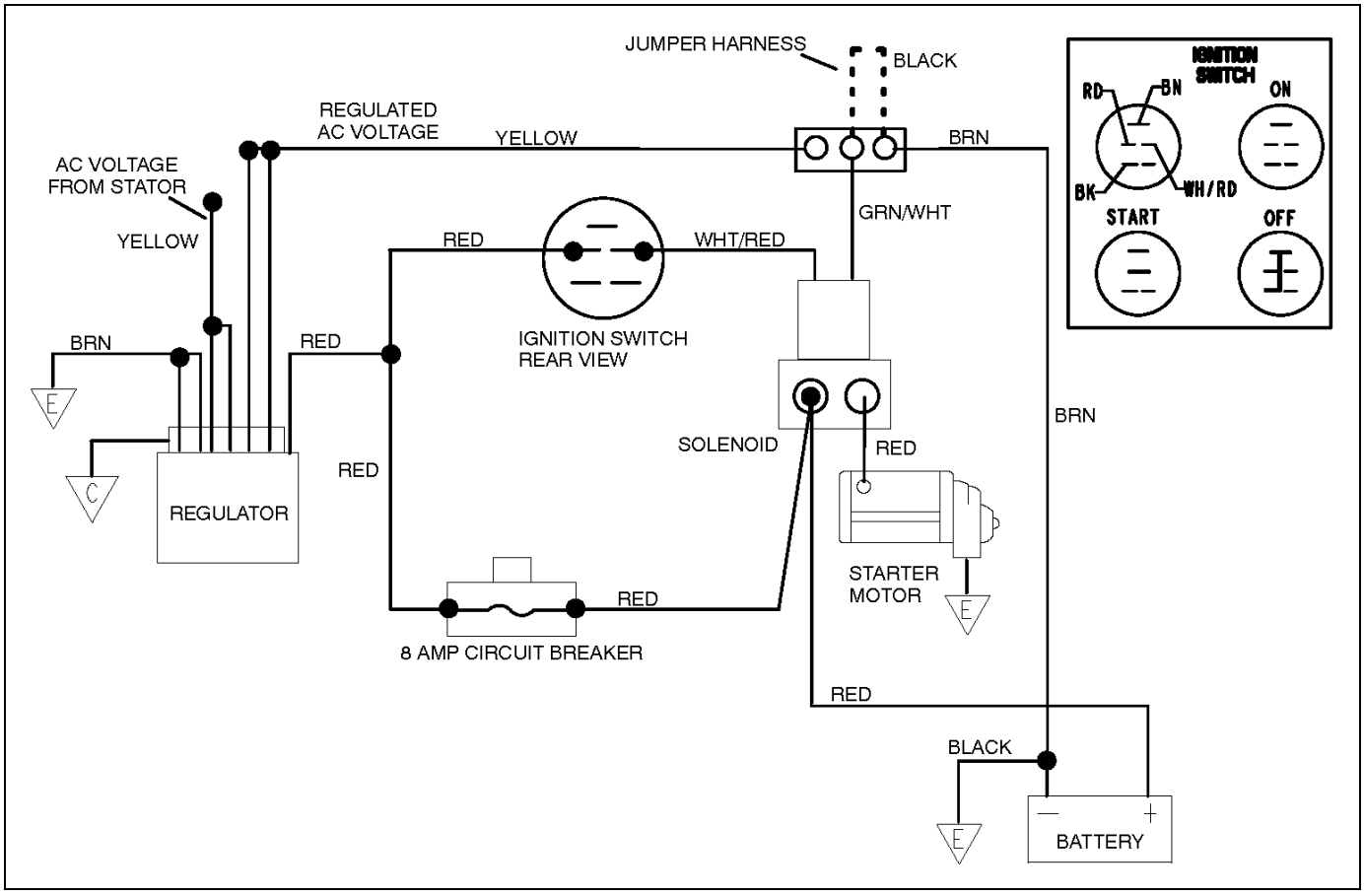
NOTE: Always disconnect the TPS on carbureted engines prior to checking ignition timing.

	EC55PM120		600 CFI / CARB.		700 CFI		800 CFI	
ROD/STROKE (mm)	120mm ROD 65mm STROKE		128mm ROD 64mm STROKE		128mm ROD 68mm STROKE		132mm ROD 70mm STROKE	
Degrees BTDC	MM	Inches	MM	Inches	MM	Inches	MM	Inches
1	0.0063	0.0002	0.0061	0.0002	0.0066	0.0003	0.0067	0.0003
2	0.0252	0.0010	0.0244	0.0010	0.0262	0.0010	0.0270	0.0011
3	0.0566	0.0022	0.0548	0.0022	0.0590	0.0023	0.0607	0.0024
4	0.1006	0.0040	0.0974	0.0038	0.1048	0.0041	0.1078	0.0042
5	0.1571	0.0062	0.1522	0.0060	0.1637	0.0064	0.1684	0.0066
6	0.2261	0.0089	0.2190	0.0086	0.2356	0.0093	0.2424	0.0095
7	0.3076	0.0121	0.2979	0.0117	0.3205	0.0126	0.3298	0.0130
8	0.4016	0.0158	0.3889	0.0153	0.4184	0.0165	0.4305	0.0169
9	0.5079	0.0200	0.4919	0.0194	0.5291	0.0208	0.5445	0.0214
10	0.6265	0.0247	0.6068	0.0239	0.6528	0.0257	0.6717	0.0264
11	0.7575	0.0298	0.7336	0.0289	0.7892	0.0311	0.8121	0.0320
12	0.9006	0.0355	0.8723	0.0343	0.9383	0.0369	0.9656	0.0380
13	1.0559	0.0416	1.0227	0.0403	1.1001	0.0433	1.1321	0.0446
14	1.2232	0.0482	1.1849	0.0466	1.2745	0.0502	1.3115	0.0516
15	1.4026	0.0552	1.3586	0.0535	1.4614	0.0575	1.5038	0.0592
16	1.5938	0.0628	1.5439	0.0608	1.6606	0.0654	1.7089	0.0673
17	1.7969	0.0707	1.7406	0.0685	1.8722	0.0737	1.9266	0.0758
18	2.0117	0.0792	1.9487	0.0767	2.0960	0.0825	2.1569	0.0849
19	2.2380	0.0881	2.1681	0.0854	2.3319	0.0918	2.3996	0.0945
20	2.4759	0.0975	2.3986	0.0944	2.5798	0.1016	2.6547	0.1045
21	2.7252	0.1073	2.6402	0.1039	2.8395	0.1118	2.9220	0.1150
22	2.9857	0.1175	2.8927	0.1139	3.1110	0.1225	3.2013	0.1260
23	3.2574	0.1282	3.1560	0.1243	3.3941	0.1336	3.4927	0.1375
24	3.5401	0.1394	3.4300	0.1350	3.6887	0.1452	3.7958	0.1494
25	3.8336	0.1509	3.7146	0.1462	3.9946	0.1573	4.1106	0.1618
26	4.1379	0.1629	4.0096	0.1579	4.3117	0.1698	4.4369	0.1747
27	4.4528	0.1753	4.3149	0.1699	4.6399	0.1827	4.7746	0.1880
28	4.7782	0.1881	4.6303	0.1823	4.9789	0.1960	5.1235	0.2017
29	5.1138	0.2013	4.9558	0.1951	5.3287	0.2098	5.4835	0.2159
30	5.4595	0.2149	5.2911	0.2083	5.6891	0.2240	5.8543	0.2305
31	5.8152	0.2289	5.6361	0.2219	6.0598	0.2386	6.2358	0.2455
32	6.1807	0.2433	5.9907	0.2359	6.4408	0.2536	6.6278	0.2609
33	6.5559	0.2581	6.3546	0.2502	6.8318	0.2690	7.0302	0.2768
34	6.9405	0.2732	6.7278	0.2649	7.2326	0.2847	7.4427	0.2930
35	7.3343	0.2888	7.1099	0.2799	7.6431	0.3009	7.8652	0.3097
36	7.7372	0.3046	7.5010	0.2953	8.0632	0.3174	8.2974	0.3267
37	8.1491	0.3208	7.9007	0.3111	8.4925	0.3343	8.7392	0.3441
38	8.5696	0.3374	8.3089	0.3271	8.9308	0.3516	9.1903	0.3618
39	8.9986	0.3543	8.7254	0.3435	9.7381	0.3692	9.6506	0.3799
40	9.4360	0.3715	9.1501	0.3602	9.8340	0.3872	10.1198	0.3984

©2010 Polaris Sales Inc.

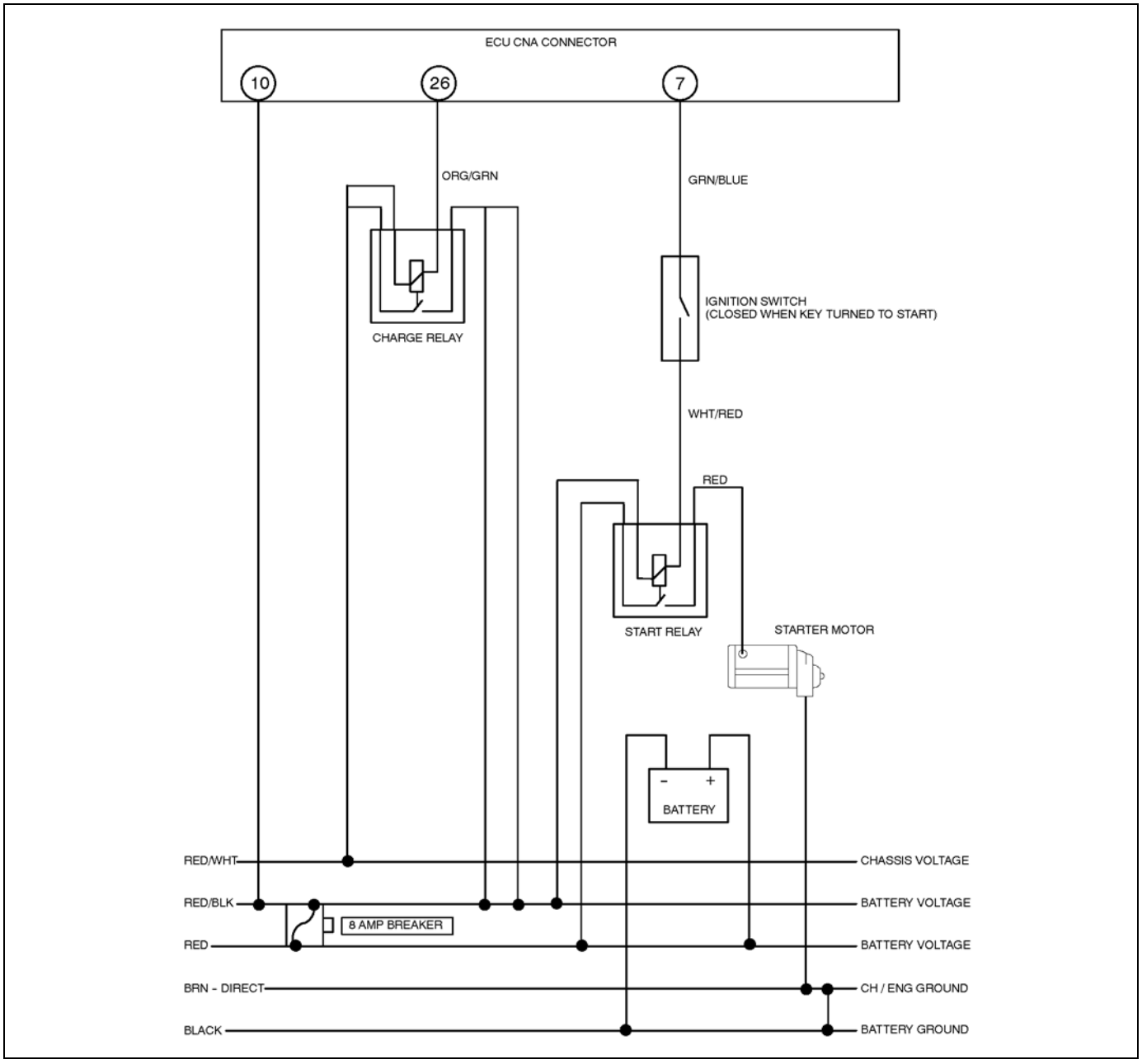
ELECTRIC START - IQ CARBURETED / CFI

System Schematic - 600 Carbureted



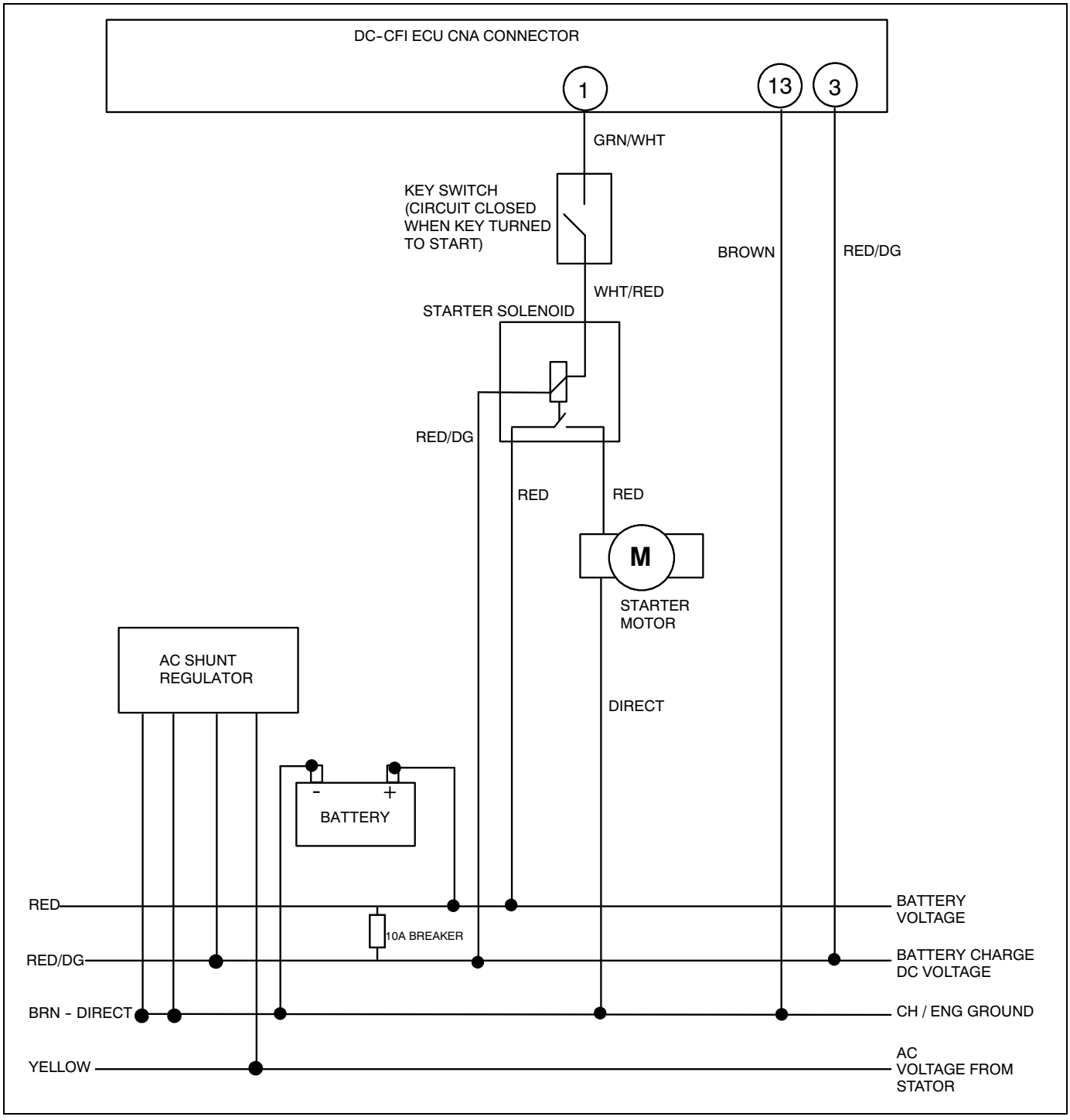
9922854 - 2007-2011 IQ Service Manual
©2010 Polaris Sales Inc.

Electric Start System - CFI



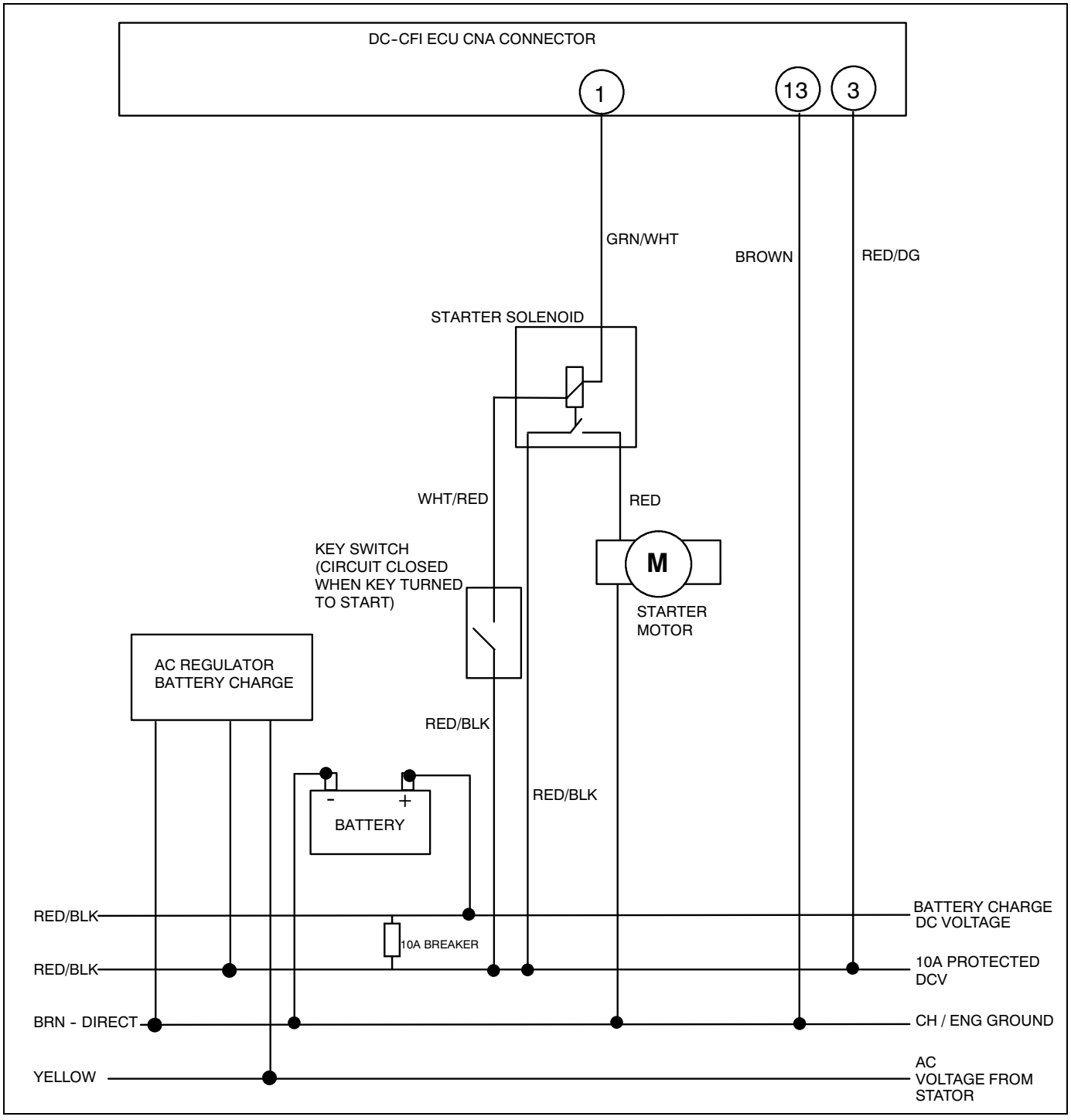
©2010 Polaris Sales Inc.

Electric Start System - DC-CFI



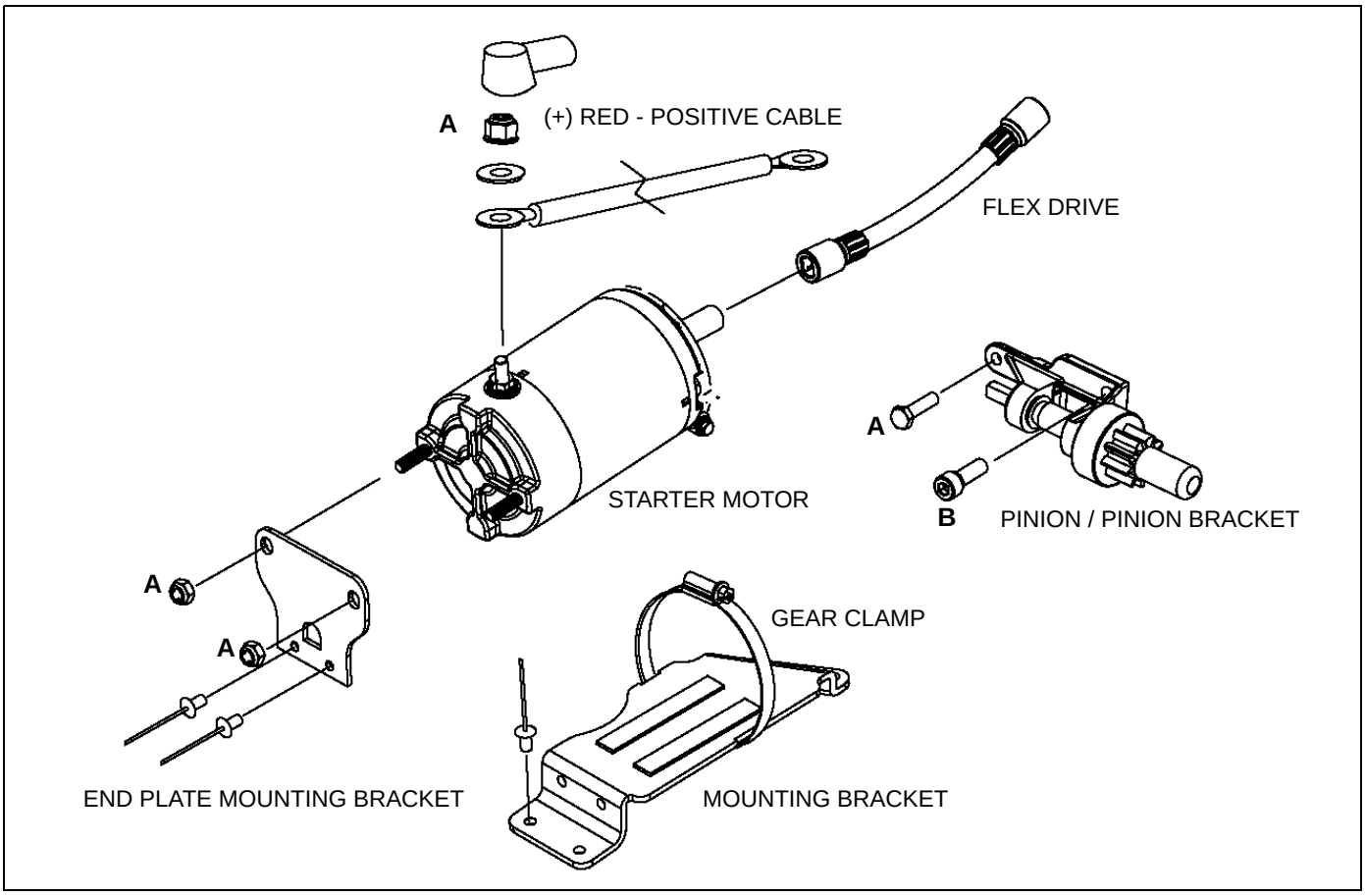
9922854 - 2007-2011 IQ Service Manual
©2010 Polaris Sales Inc.

Electric Start System - Widetrak IQ 600



9922854 - 2007-2011 IQ Service Manual
©2010 Polaris Sales Inc.

Starter Motor / Flex Drive Assembly



⚠ CAUTION

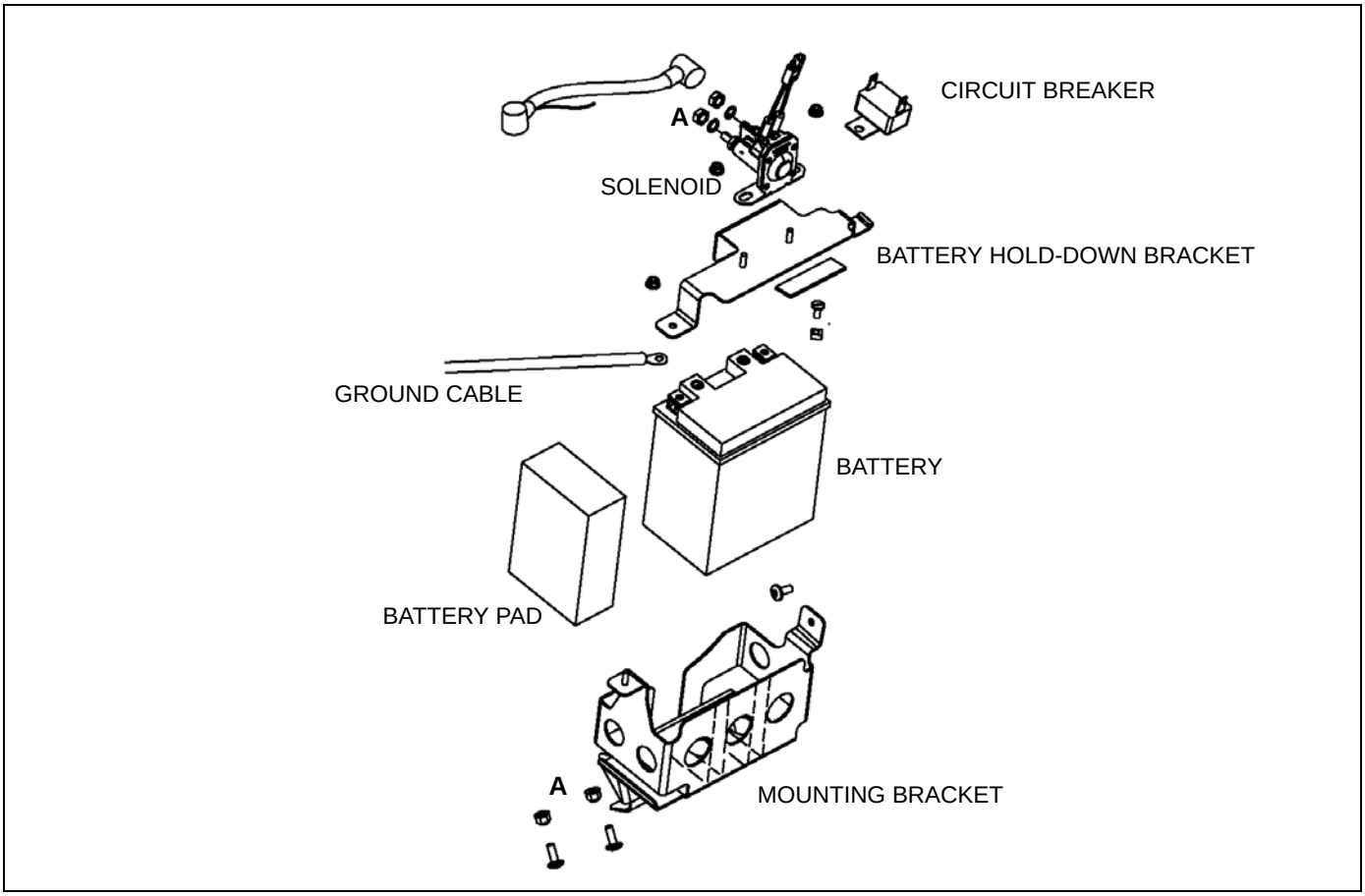
Always disconnect the BLACK (-) cable first, and then the RED (+) cable from the battery prior to working with the starter motor. Reverse process when reconnecting battery.

= T

A = 8 Ft.Lbs. (11 Nm)
B = 15 Ft.Lbs. (20 Nm)

©2010 Polaris Sales Inc.

IQ Battery Box Assembly



⚠ CAUTION

Always disconnect the BLACK (-) cable first, and then the RED (+) cable from the battery prior to working with the starter motor. Reverse process when reconnecting battery.

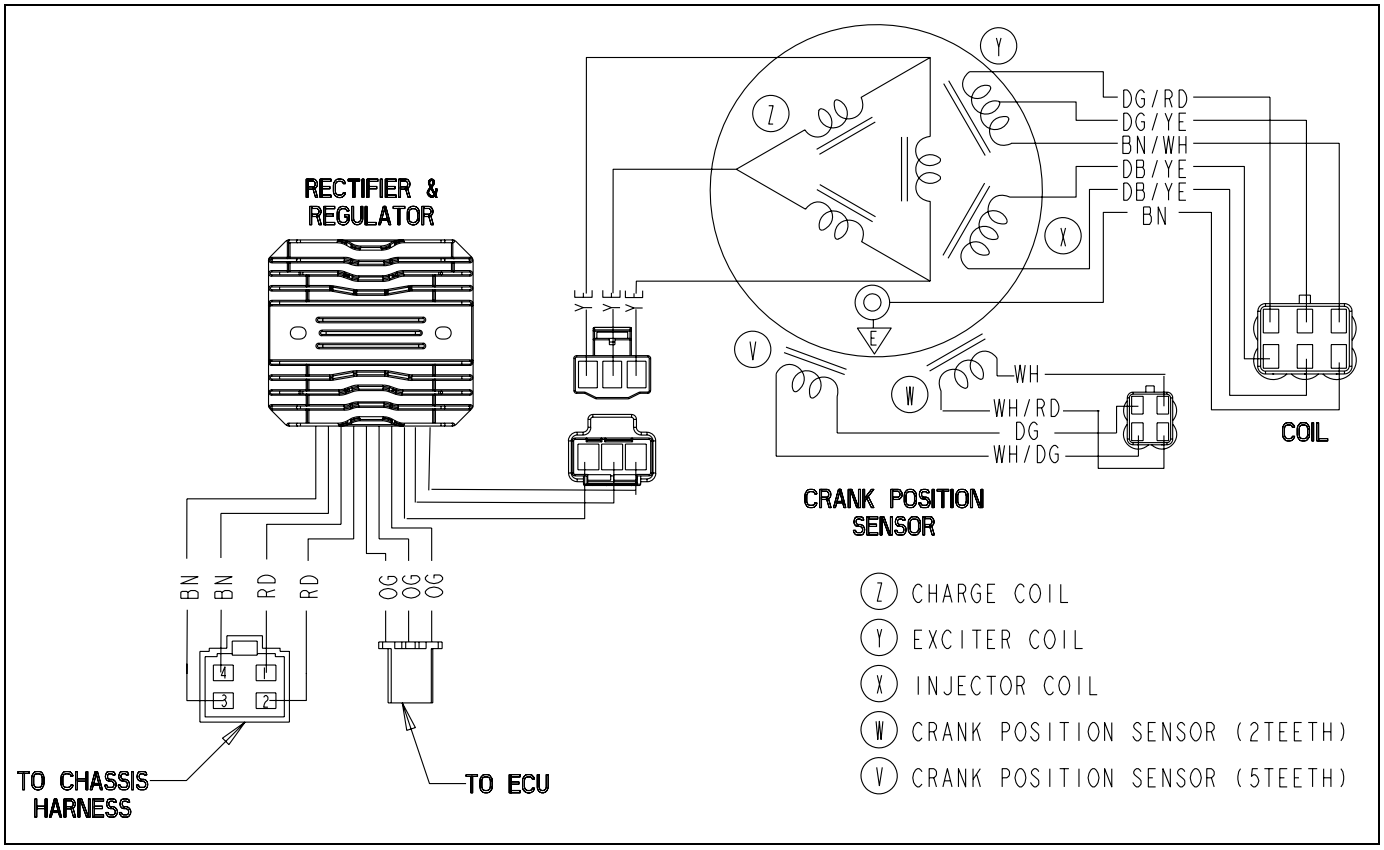
= T

A = 8 Ft.Lbs. (11 Nm)

©2010 Polaris Sales Inc.

CFI / DC-CFI ELECTRICAL SYSTEMS

CFI Stator Assembly

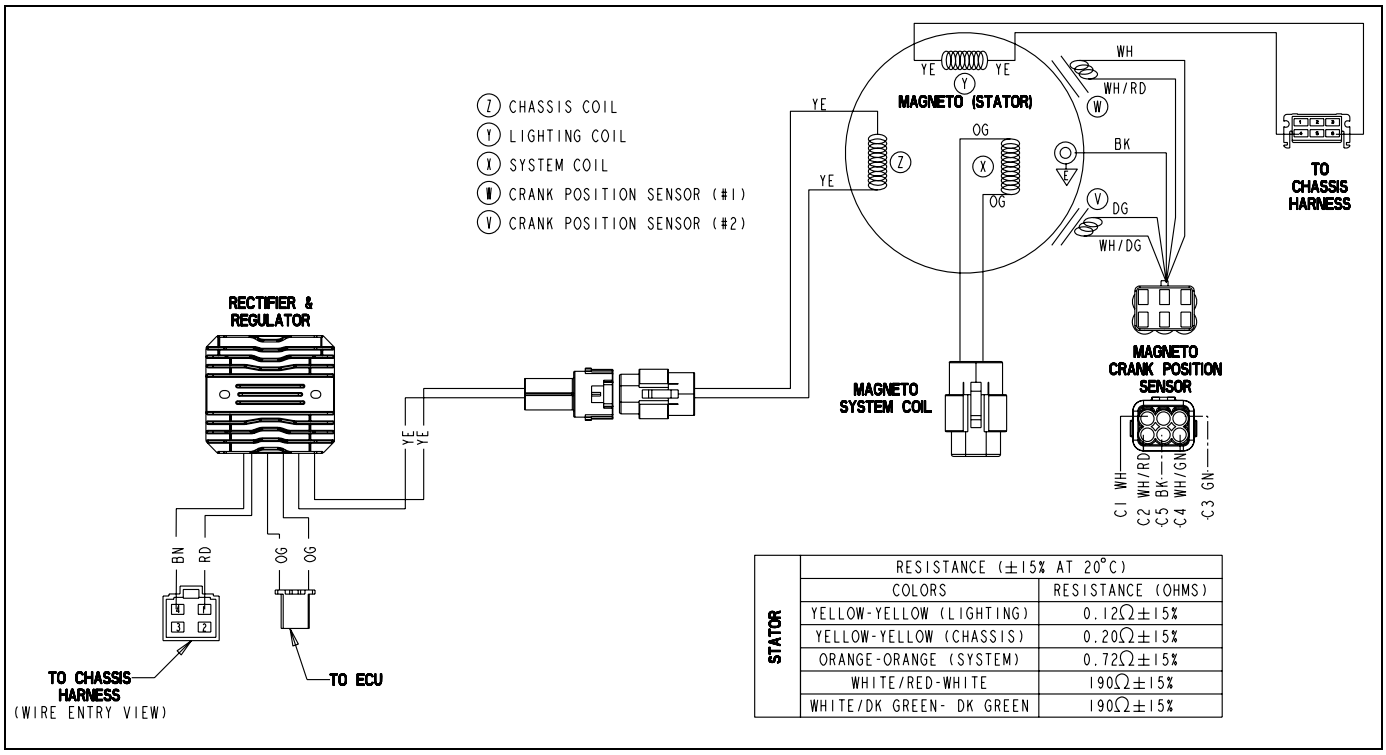


Stator Specifications

ITEM	COLOR	SYSTEM FUNCTION	RESISTANCE +/- 15% @68°F (20°C)
Charge Coil (Z)	YELLOWS	Chassis / Battery Charge Power Head / Tail Lights Hand / Thumb Warmers	YEL TO YEL = 0.13Ω NO CONTINUITY TO GROUND
Crank Position Sensors (CPS) (V and W)	GRN to WHT/GRN	Crank Position Sensor (5 Tooth) Ignition timing	GRN to WHT/GRN = 190Ω
	WHT to WHT/RED	Crank Position Sensor (2 Tooth) Locates TDC and RPM	WHT to WHT/RED = 190Ω
Exciter Coils (Y)	GRN/RED	Exciter Coil - Powers the Ignition Coils / ECU	GRN/RED to GRN/YEL = 15Ω
	GRN/YEL		GRN/RED to BRN/WHT = 30Ω
	BRN/WHT		BRN/WHT to Ground = 0Ω
Injector Coils (X)	BLU/YEL TO BLU/YEL	16VDC - Supplies power to fuel injectors.	BLU/YEL to BLU/YEL = 2.4Ω
Ground	BROWN	ENGINE GROUND	0Ω

9922854 - 2007-2011 IQ Service Manual
©2010 Polaris Sales Inc.

DC-CFI Stator Assembly



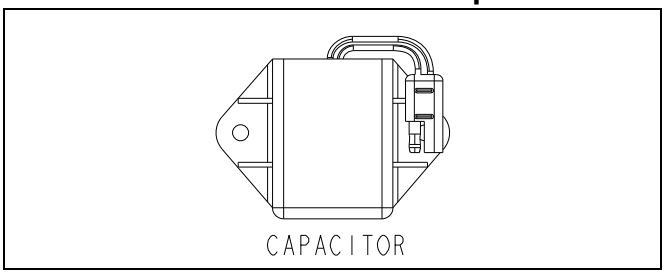
STATOR	RESISTANCE (±15% AT 20°C)	
	COLORS	RESISTANCE (OHMS)
	YELLOW-YELLOW (LIGHTING)	0.12Ω±15%
	YELLOW-YELLOW (CHASSIS)	0.20Ω±15%
	ORANGE-ORANGE (SYSTEM)	0.72Ω±15%
	WHITE/RED-WHITE	190Ω±15%
	WHITE/DK GREEN- DK GREEN	190Ω±15%

DC-CFI Stator Specifications

ITEM	COLOR	SYSTEM FUNCTION	RESISTANCE +/- 15% @68°F (20°C)
AC Lighting Coil (Y)	YELLOW to YELLOW	14VAC Chassis Power - Battery Charge (Electric Start Equipped) - Head / Tail Lights - Hand / Thumb Warmers	YELLOW TO YELLOW = 0.12Ω NO CONTINUITY TO GROUND
DC Chassis Coil (Z)	YELLOW to YELLOW	14VDC Chassis Power - Fuel Pump - Chassis Relay Coil - EV Solenoid - MFD Gauge	YELLOW TO YELLOW = 0.20Ω NO CONTINUITY TO GROUND
DC System Coil (X)	ORANGE to ORANGE	16 VDC System Power - Fuel Injector Power - ECU / Sensor Power (Regulated to 5VDC) - Ignition Coil Power	ORANGE TO ORANGE = 0.72Ω NO CONTINUITY TO GROUND
CRANK POSITION SENSOR (CPS)	GRN to WHT/GRN	Crank Position Sensor (5 Tooth) Ignition timing	GRN to WHT/GRN = 190Ω
	WHT to WHT/RED	Crank Position Sensor (2 Tooth) Locates TDC and RPM	WHT to WHT/RED = 190Ω
ENGINE GROUND	BROWN	Engine Ground	0Ω

©2010 Polaris Sales Inc.

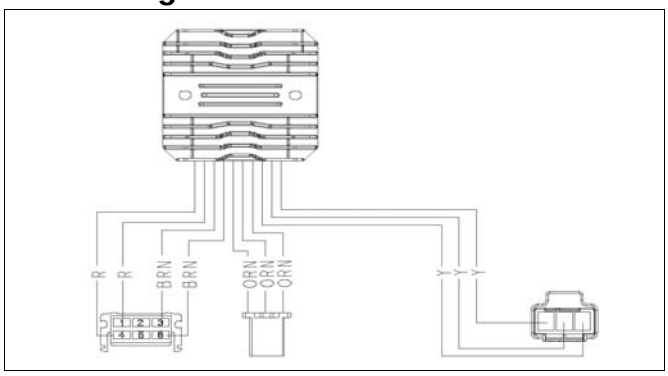
CFI / DC-CFI Chassis Power Capacitor



Capacitor Testing

1. Charge the capacitor for 10 seconds using a 12 volt battery by connecting the positive (+) lead to the Red/White wire and the negative (-) lead to the brown wire.
2. Monitor the capacitor voltage with a multimeter. The voltage should slowly drain down from the initial charge. If the cap does not hold a charge or drains rapidly, replace the component.

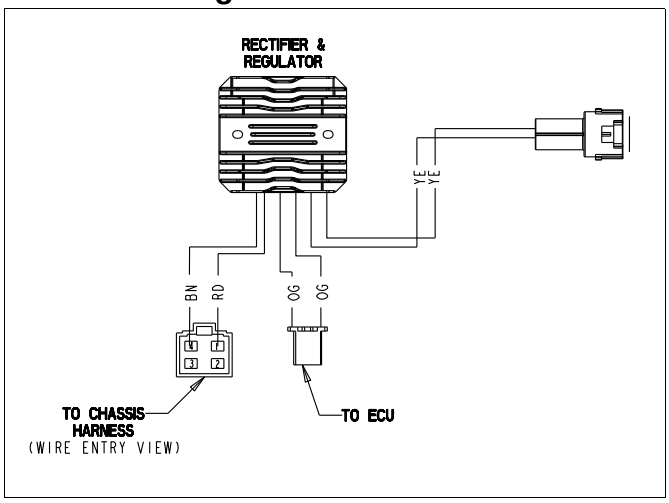
CFI DC Regulator / Rectifier



CFI DC Regulator / Rectifier Connections

CONNECTOR	WIRE COLORS	ITEM
Stator	YELLOW	VAC from stator charge coils.
ECU	ORANGE	VDC supplied to ECU to boost power to fuel pump during engine start-up.
Chassis	BROWN	14.5 VDC chassis power.
	RED	

DC-CFI DC Regulator / Rectifier



DC-CFI DC Regulator / Rectifier Connections

CONNECTOR	WIRE COLORS	ITEM
Stator	YELLOW	VAC from stator coils.
ECU	ORANGE	VDC supplied to ECU to boost power to fuel pump during engine start-up.
Chassis	BROWN	14.5 VDC Chassis power.
	RED	

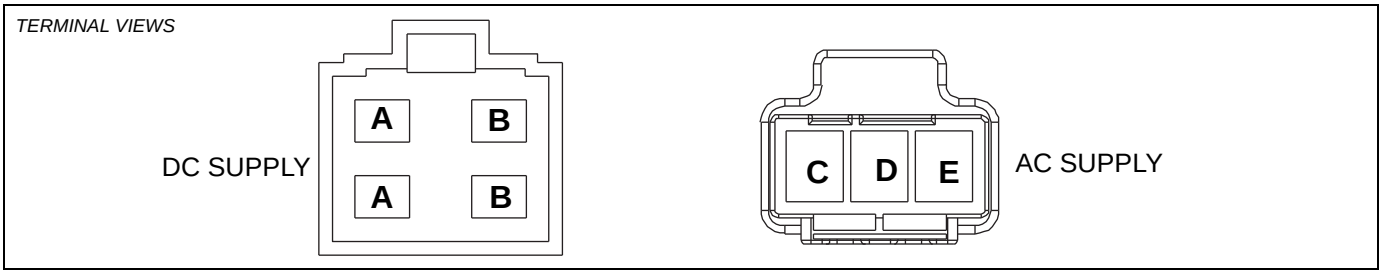
9922854 - 2007-2011 IQ Service Manual
©2010 Polaris Sales Inc.

CFI Regulator/Rectifier Diode Testing

The CFI regulator/rectifiers, PNs: 4011731 and 4012476, can be tested using a multimeter.

Always test the regulator/rectifier after replacing a damaged ECU. A faulty regulator/rectifier can damage the ECU.

Set multimeter to DIODE CHECK MODE. OL equals OPEN LINE. 0 equals zero OHMS. Disconnect all wire connectors before testing.



4011731 / 4012476 CFI Regulator/Rectifier Testing

		MULTIMETER NEGATIVE LEAD (BLACK)				
		A (RED)	B (BROWN)	C (YELLOW)	D (YELLOW)	E (YELLOW)
MULTIMETER POSTIVE LEAD (RED)	A (RED)			OL	OL	OL
	B (BROWN)			.131 - .731	.132 - .732	.133 - .733
	C (YELLOW)	.130 - .730	OL		OL	OL
	D (YELLOW)	.133 - .733	OL	OL		OL
	E (YELLOW)	.134 - .734	OL	OL	OL	

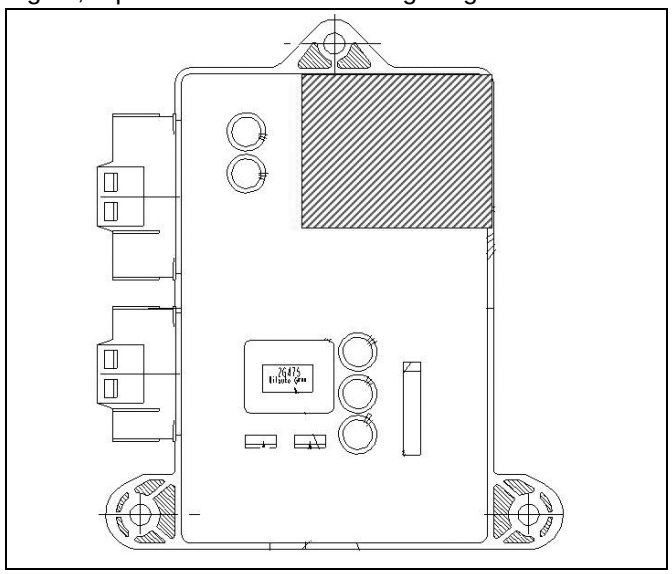
Reading using **DIODE CHECK MODE**. Measure at 68° F (20° C).
Disconnect all wire connectors before testing. Shaded boxes indicate no test.

©2010 Polaris Sales Inc.

Over-Voltage / Voltage Spike Test

The diode check test cannot be used to determine if the regulator / rectifier has supplied the ECU with voltage spikes. To determine if the regulator / rectifier has damaged the ECU with voltage spikes, the potting material on the backside of the ECU must be inspected.

If the ECU has been damaged by over-voltage, the potting material in the shaded region will be melted, discolored, or bubbled. If potting material is damaged in the shaded region, replace the ECU and voltage regulator / rectifier.

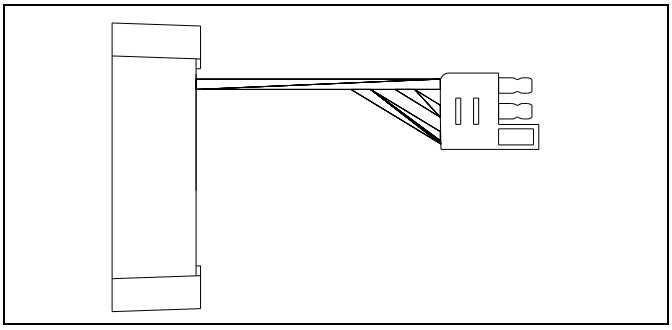


©2010 Polaris Sales Inc.

DC-CFI AC Regulator/Battery Charge Rectifier

DC-CFI models feature an AC regulator/DC (battery charge) rectifier. 600 IQ Widetrak versions also supply DC power to drive the radiator fan motor.

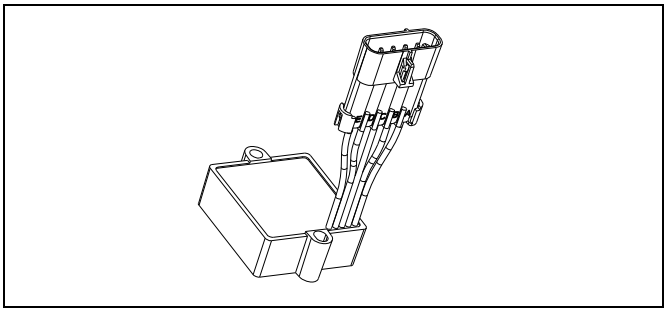
2009 DC-CFI AC Regulator



Circuit Specifications

PLUG/PIN/COLOR	FUNCTION
1 - RED	14.7V BATTERY (+)
2 - YELLOW	14.3 ACV (FROM STATOR)
3 - BROWN	GROUND (-)

2010 600 IQ Widetrak AC Regulator

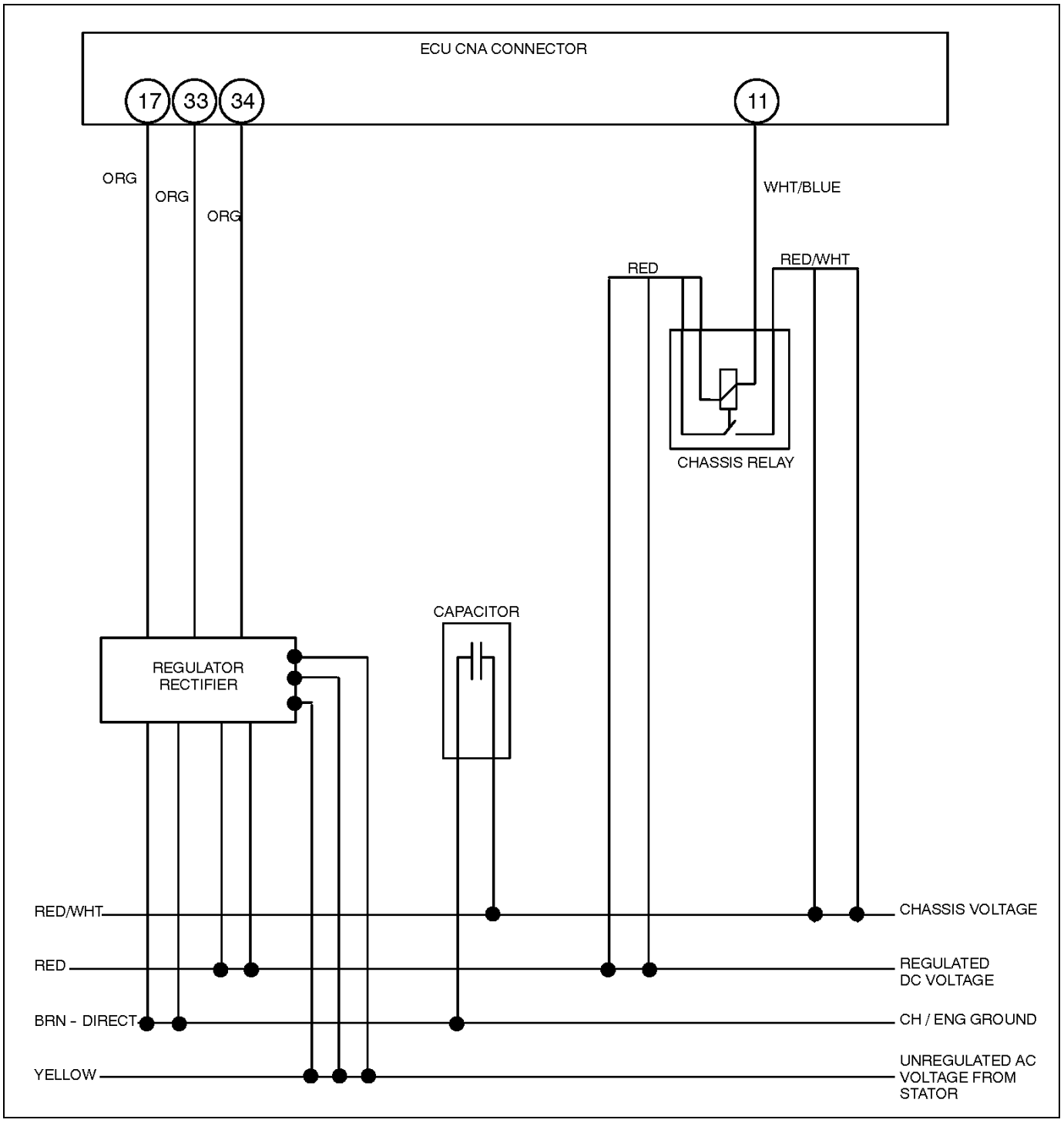


Circuit Specifications

PLUG/PIN/COLOR	FUNCTION
A - RED/BLK	14.7V BATTERY (+)
B - YELLOW	14.3 ACV (FROM STATOR)
C - BROWN	GROUND (-)
D - BLK/WHT	FAN GROUND (-)
E - ORG/BLK	FAN POWER (+)

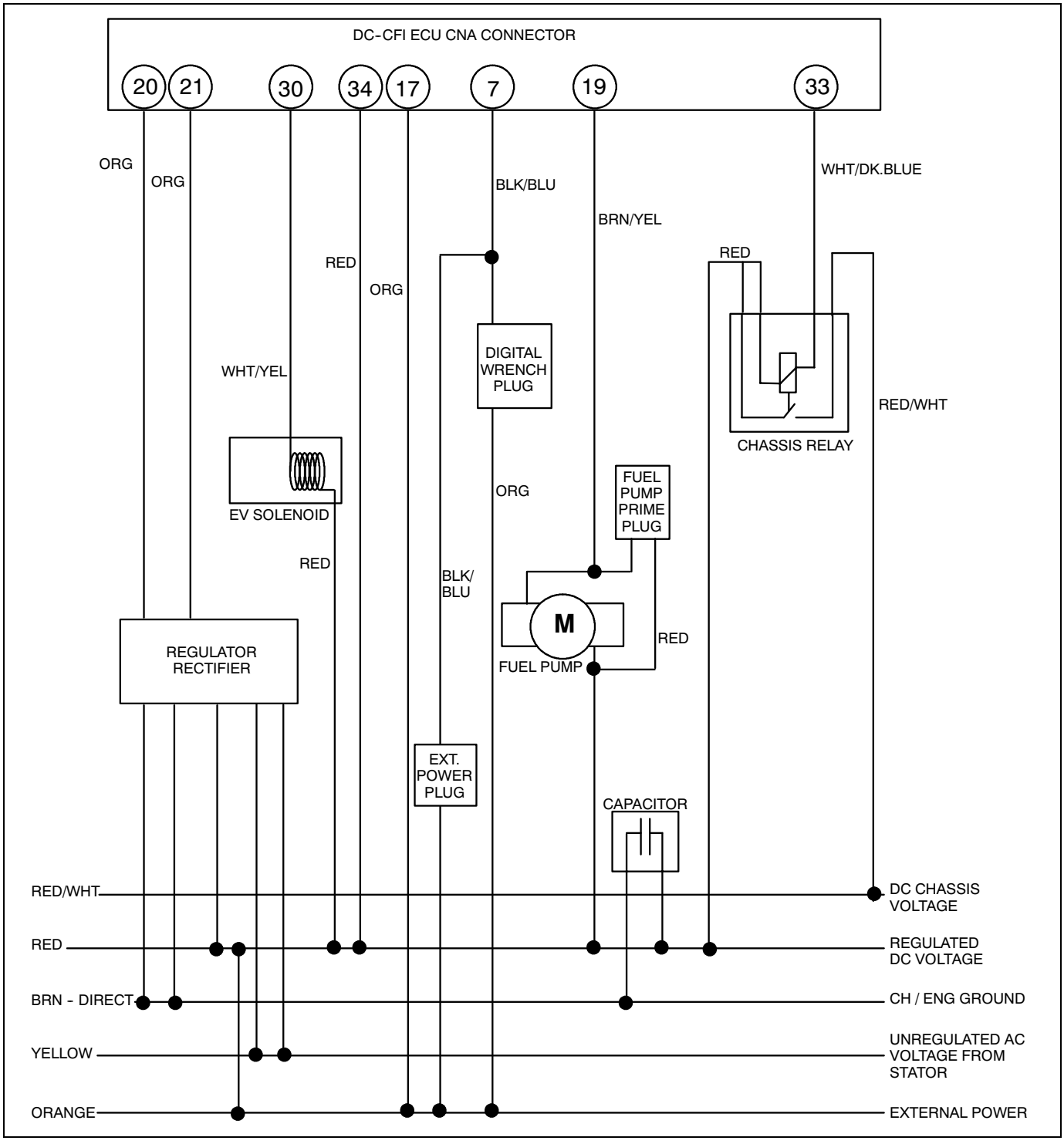
©2010 Polaris Sales Inc.

CFI Chassis Relay



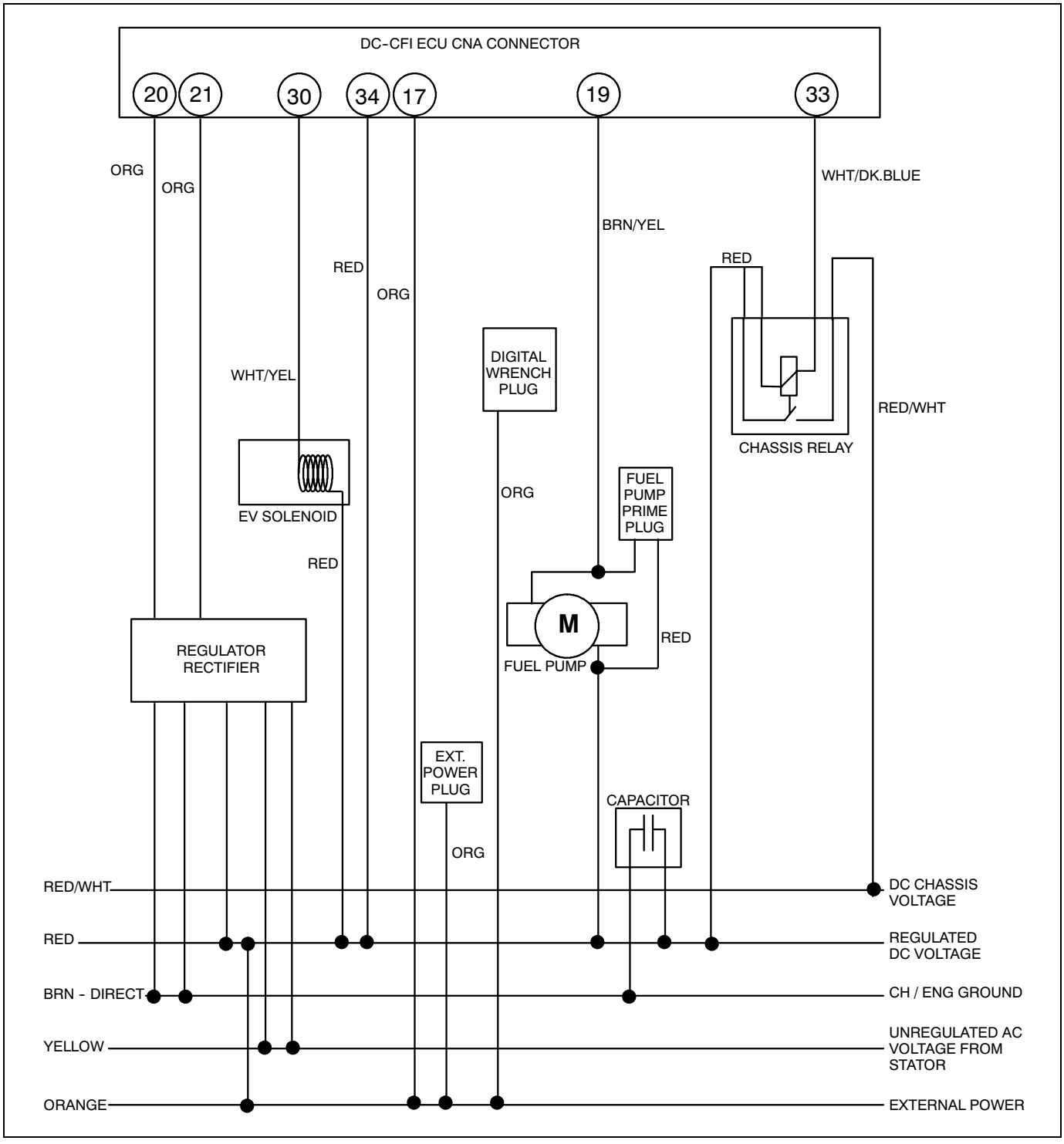
©2010 Polaris Sales Inc.

DC-CFI Regulated (RED) Power Circuits



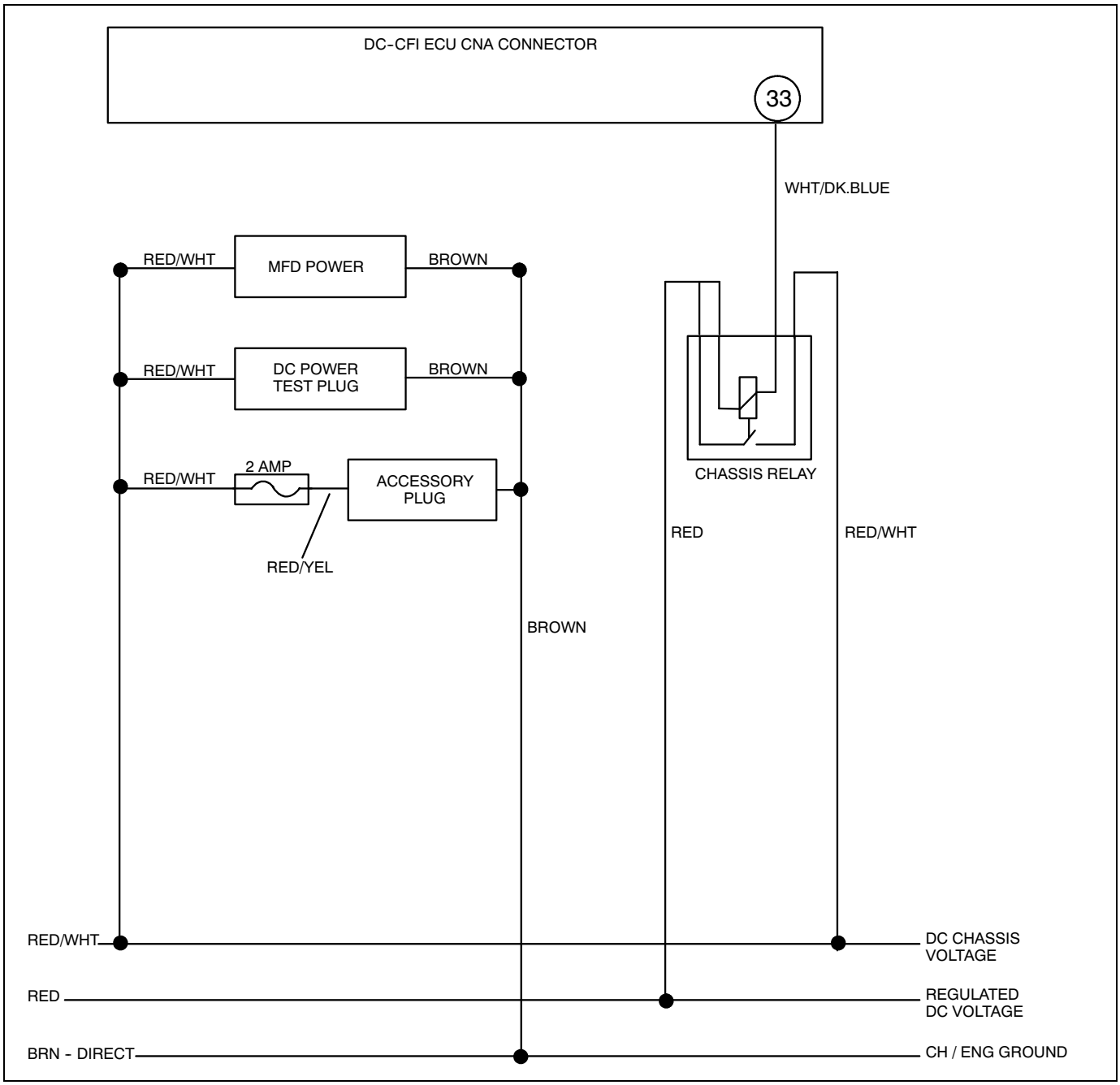
©2010 Polaris Sales Inc.

600 IQ Widetrak Regulated (RED) Power Circuits



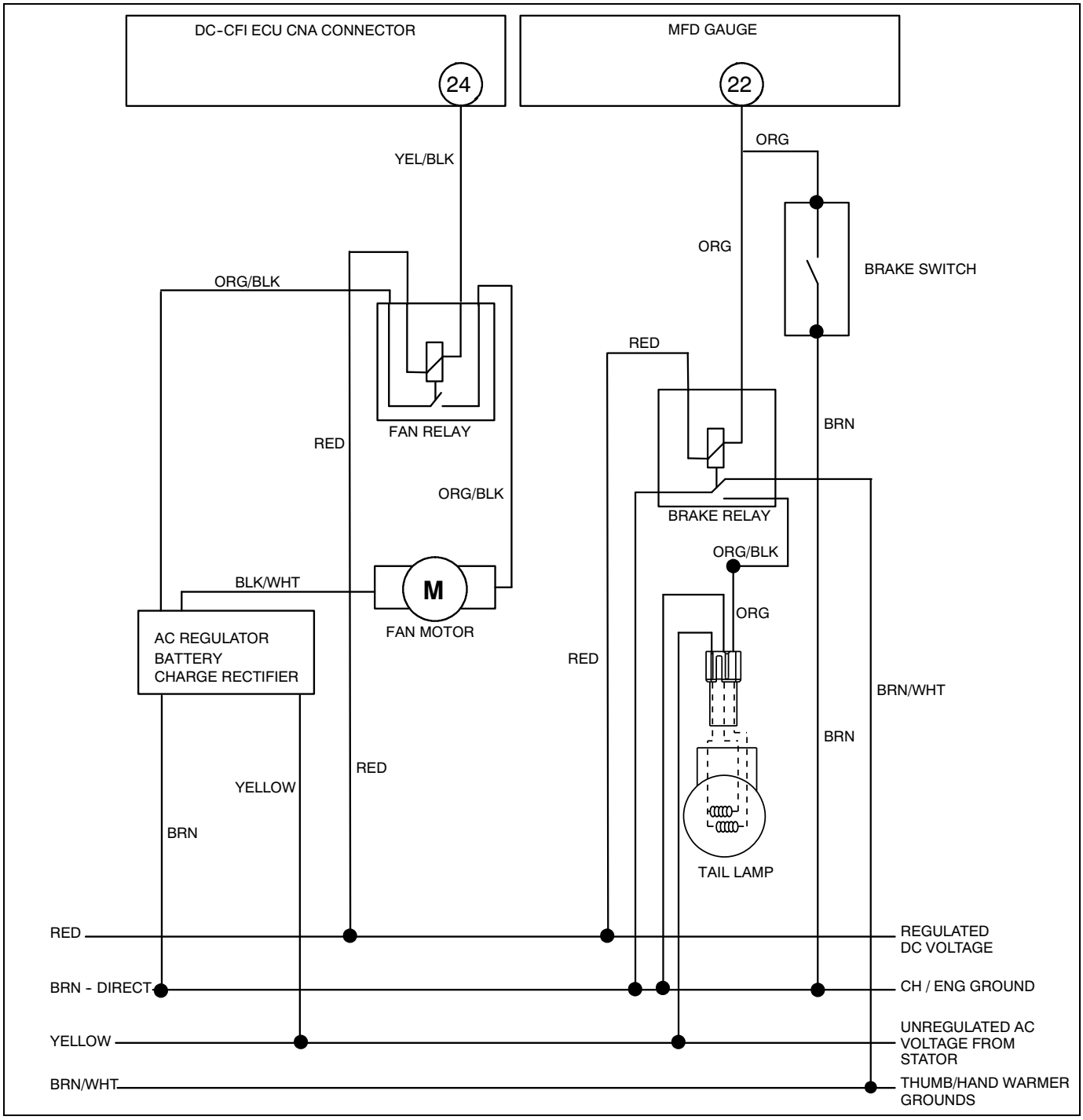
9922854 - 2007-2011 IQ Service Manual
©2010 Polaris Sales Inc.

DC-CFI/600 IQ Widetrak Chassis (Red/White) Power Circuits



©2010 Polaris Sales Inc.

600 IQ Widetrak Brake/Fan Relay Control



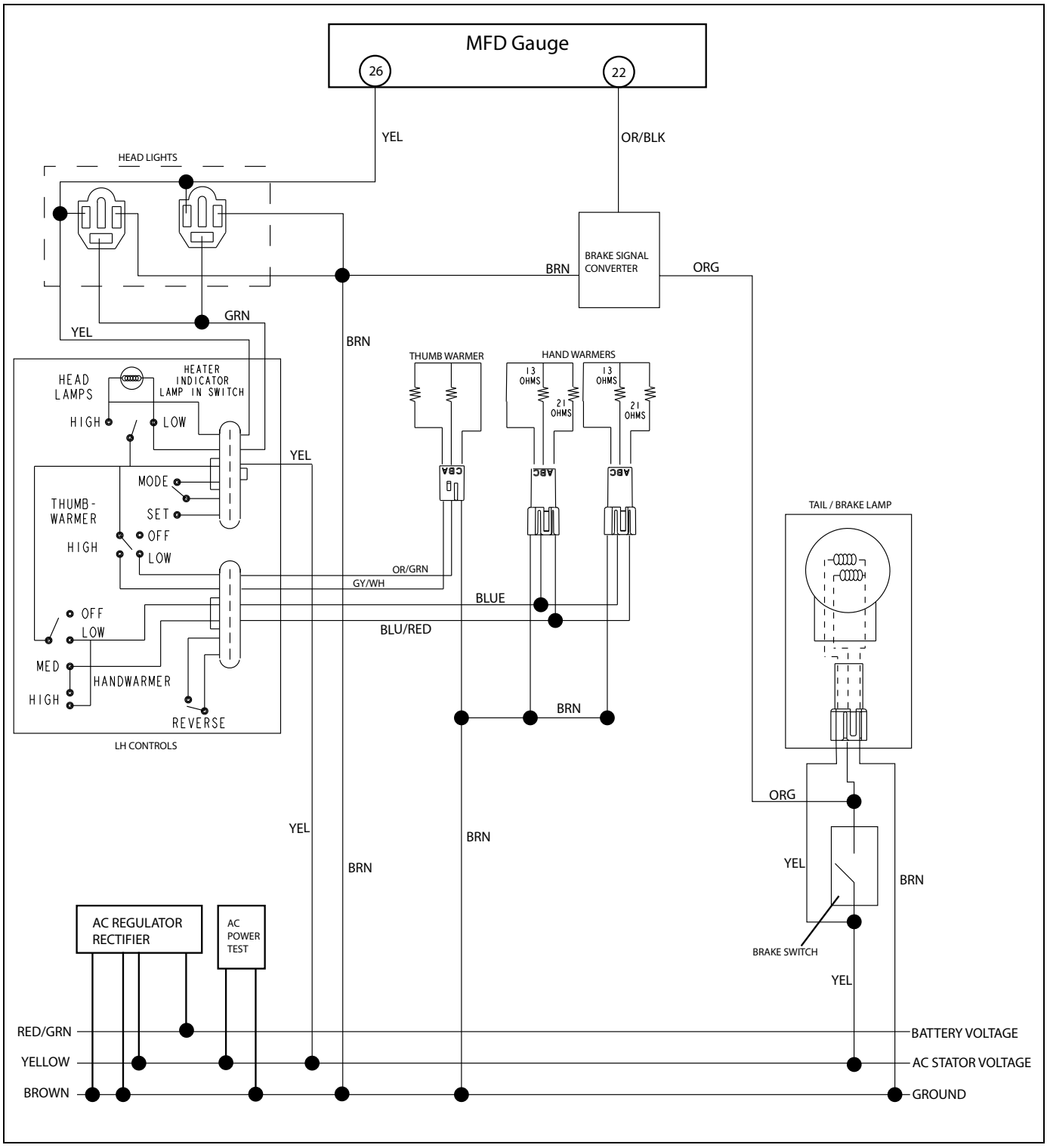
600 IQ Widetrak Fan Control Parameters

- Fan ON = Engine temperature above 149° F/65° C.
- Fan Off = Engine temperature below 134° F/57° C.

NOTE: Engine RPM must be at least 1,500 RPM for ECU to drive the fan motor.

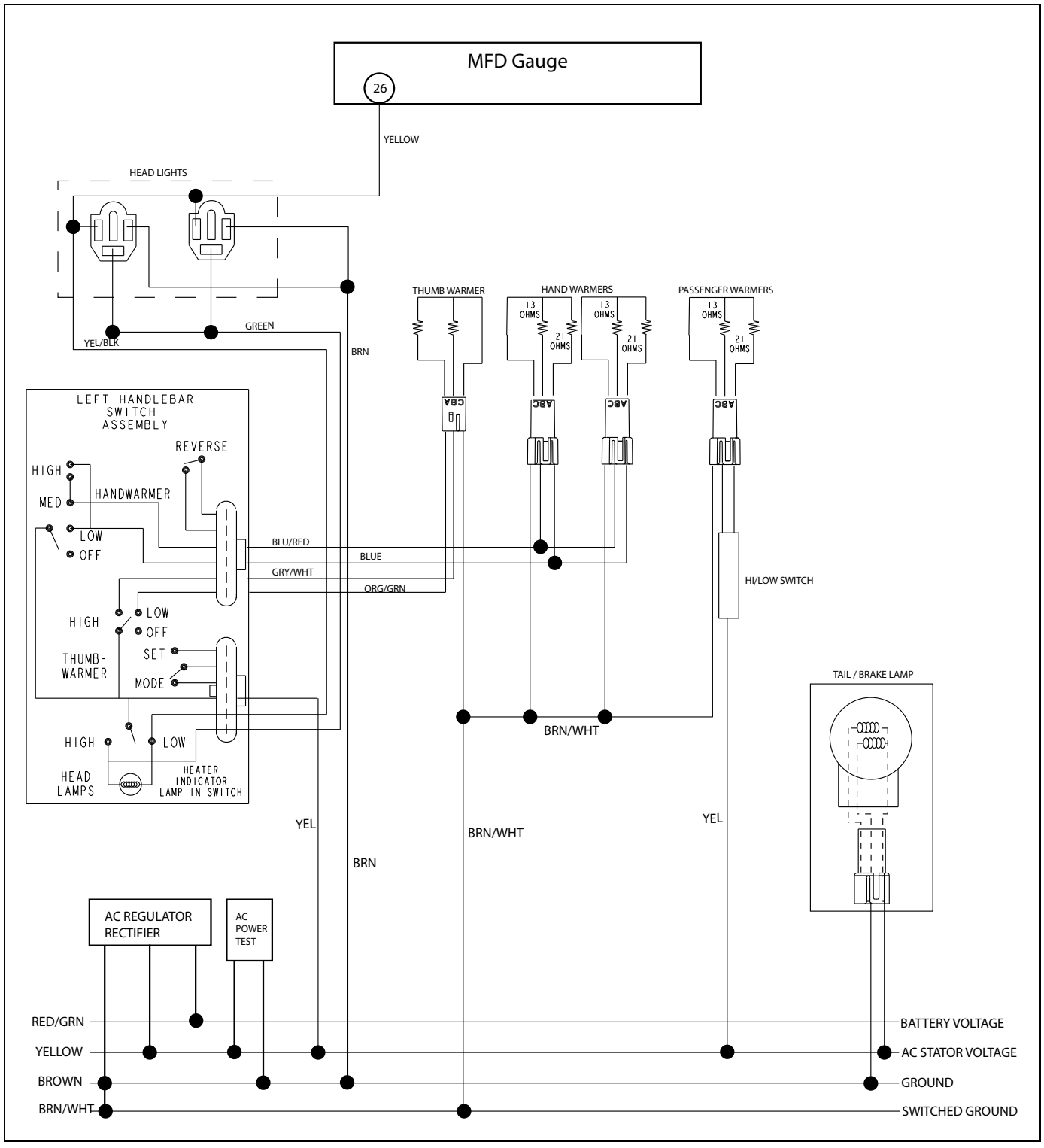
9922854 - 2007-2011 IQ Service Manual
©2010 Polaris Sales Inc.

DC-CFI AC Power (Lighting) Circuits



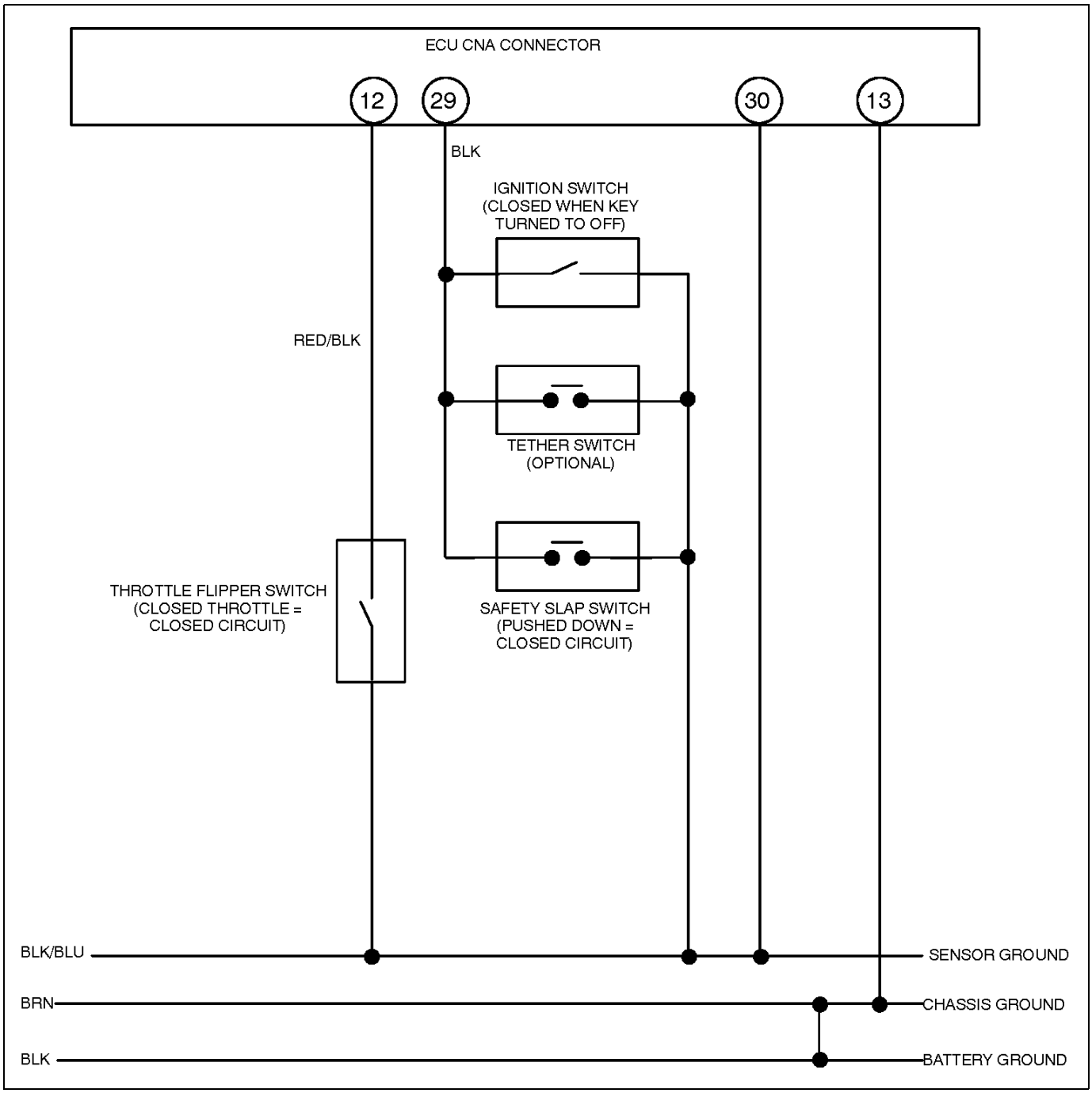
©2010 Polaris Sales Inc.

600 IQ Widetrak AC Power (Lighting) Circuits



9922854 - 2007-2011 IQ Service Manual
©2010 Polaris Sales Inc.

CFI Throttle / Ignition Kill System



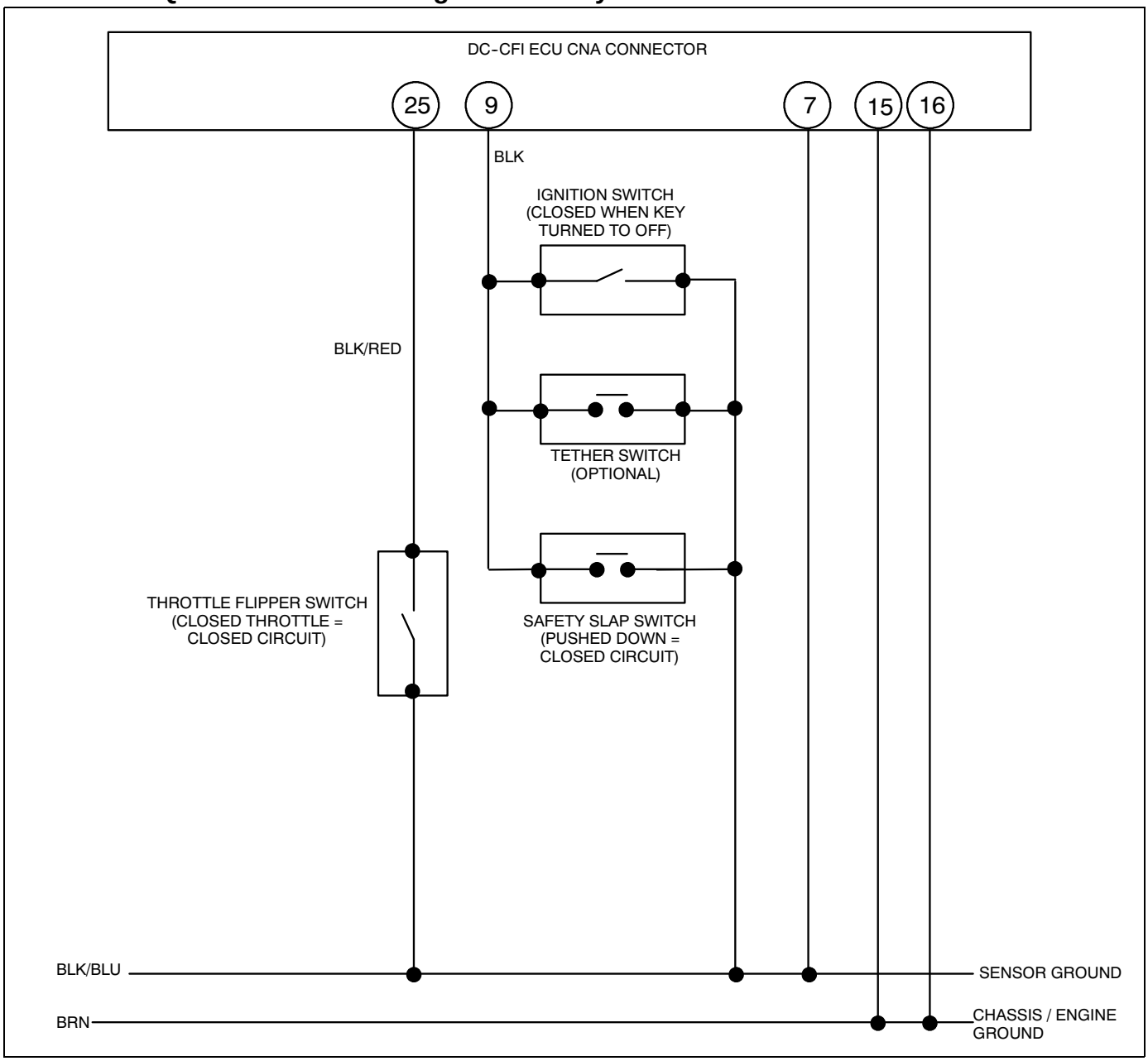
System Overview

There are two methods for cutting the ignition on CFI systems. The first is the software stop system. The software stop system only applies to the throttle flipper switch. The software stop system is activated when the throttle flipper switch is closed (closed throttle), but the TPS (throttle plate position) is still above idle. When this occurs, the ECU software will determine the throttle cable is “stuck” and kill the ignition system.

The second system is the hardware stop system. The hardware stop system is a direct ignition kill system. That is, whenever the operator turns the key to off, pulls the tether, or pushes the safety slap switch down, the ignition system is immediately killed.

©2010 Polaris Sales Inc.

DC-CFI/600 IQ Widetrak Throttle / Ignition Kill System



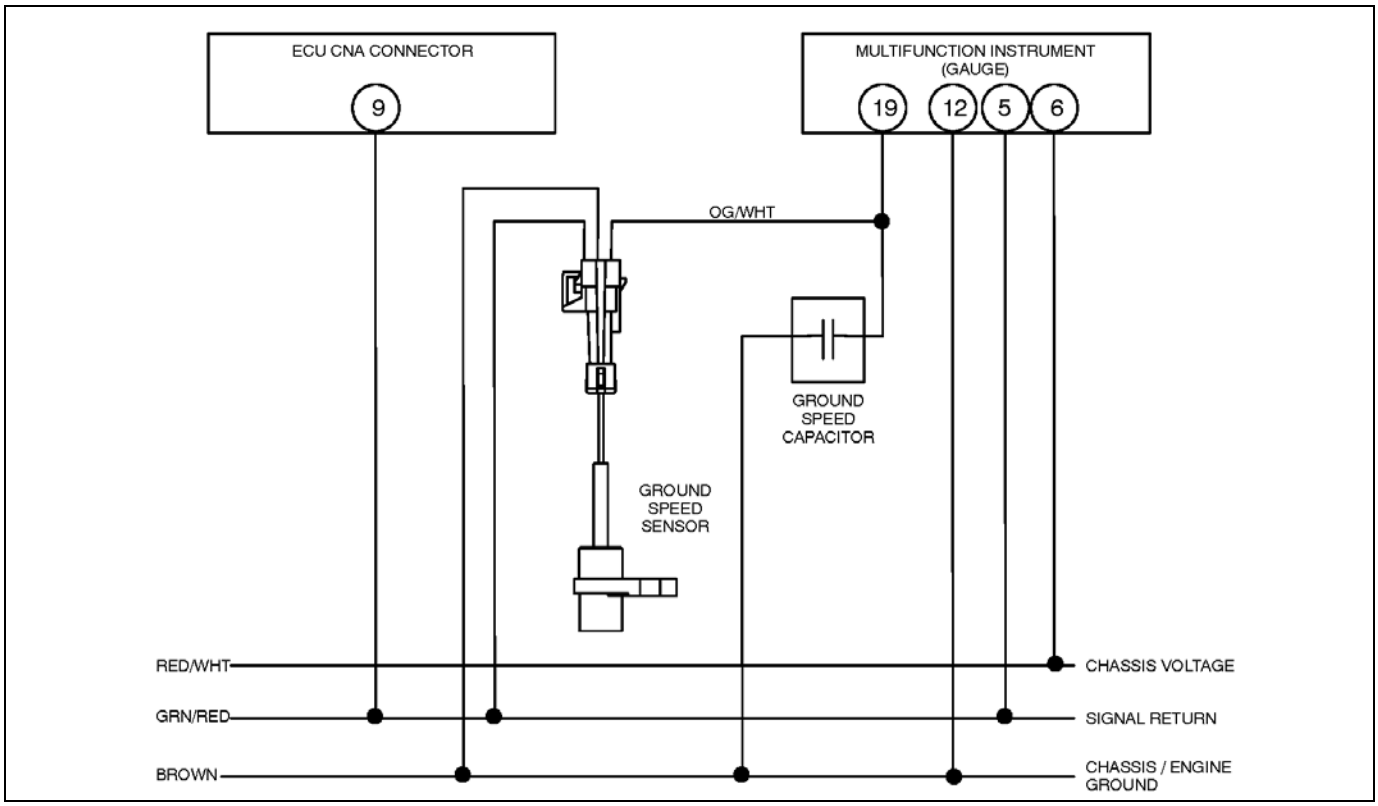
System Overview

There are two methods for cutting the ignition on DC-CFI systems. The first is the software stop system. The software stop system only applies to the throttle flipper switch. The software stop system is activated when the throttle flipper switch is closed (closed throttle), but the TPS (throttle plate position) is still above idle. When this occurs, the ECU software will determine the throttle cable is “stuck” and kill the ignition system.

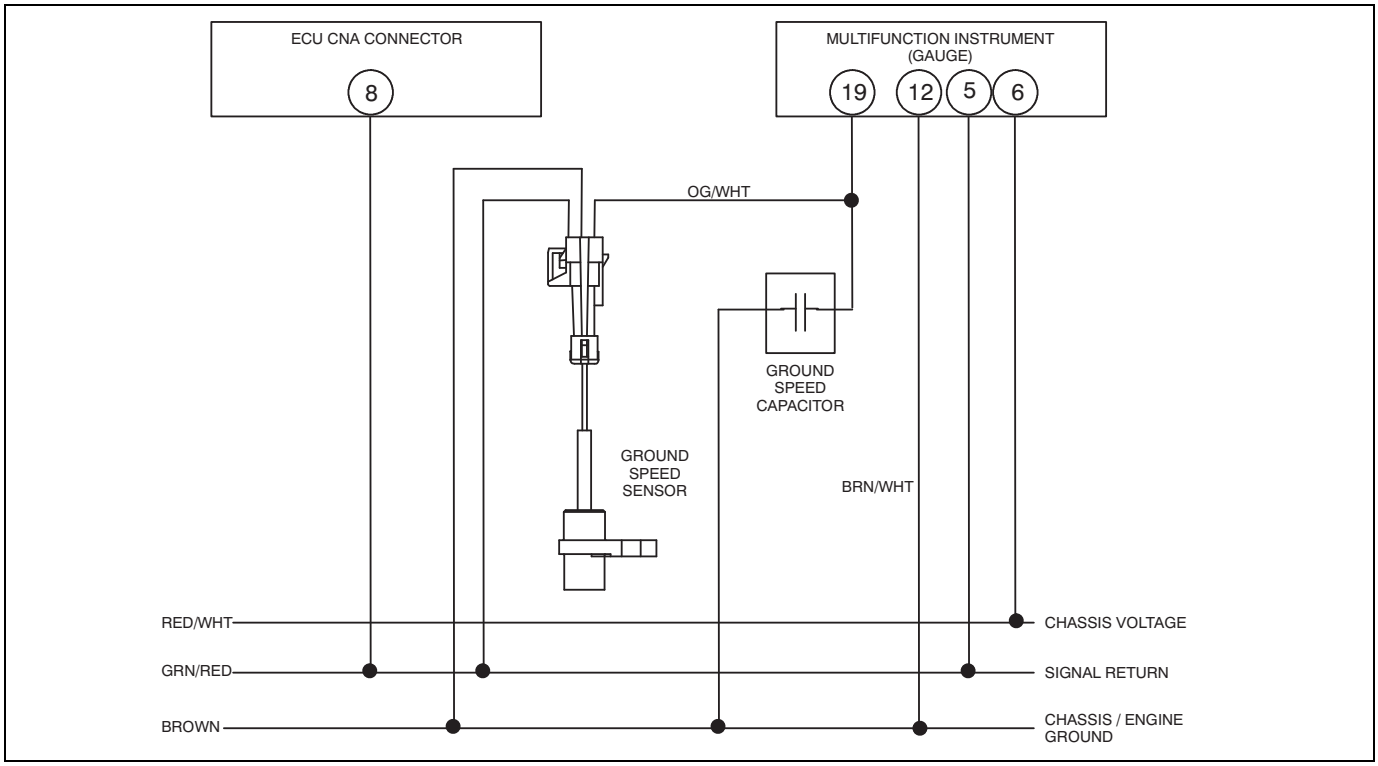
The second system is the hardware stop system. The hardware stop system is a direct ignition kill system. That is, whenever the operator turns the key to off, pulls the tether, or pushes the safety slap switch down, the ignition system is immediately killed.

©2010 Polaris Sales Inc.

CFI/DC-CFI Vehicle Speed Sensor



600 IQ Widetrak Vehicle Speed Sensor



©2010 Polaris Sales Inc.

CARBURETED ELECTRICAL SYSTEMS

600 HO Stator Specifications

NOTE: Use a multimeter to test the stator circuits. Remember to test the circuits when the engine is cold and after the engine has been running for some time.

Specifications

YEL TO BRN	0.15Ω
BRN TO ENGINE	0Ω
BLK / RED TO GRN	15Ω
RED TO GRN	15Ω
BLK or WHT TO ENGINE	0Ω
WHT / RED TO WHT	185Ω

550 Stator Specifications

Specifications

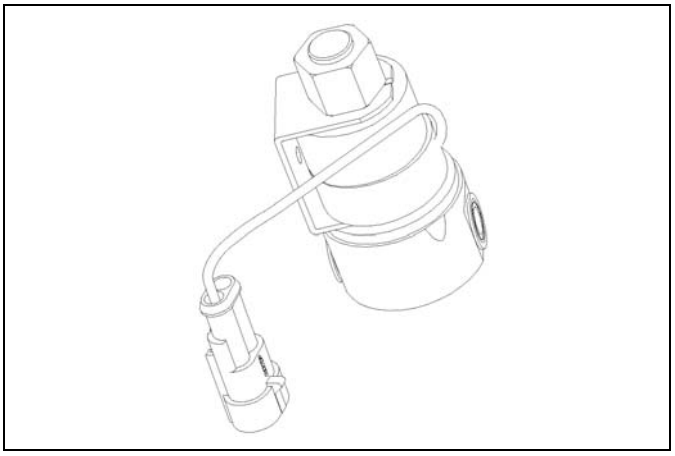
YEL TO BRN	0.16Ω
BRN TO ENGINE	0Ω
BLK / RED TO GRN	13Ω
RED TO GRN	13Ω
RED TO ENGINE	OPENΩ
BLK TO ENGINE	0Ω
WHT / RED TO WHT	185Ω
WHT TO ENGINE	OPENΩ

Ignition Coil Packs

Specifications

BLK TO WHT (Primary)	0.3Ω
BLK or WHT TO SECONDARY LEAD	OPENΩ
SECONDARY LEAD TO LEAD	5KΩ
PLUG CAPS	10KΩ

Exhaust Valve Solenoid

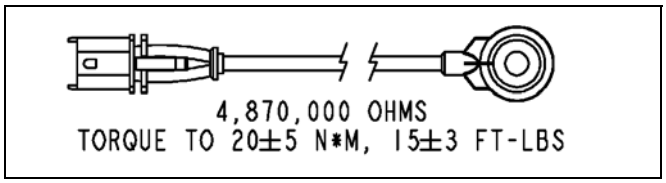


Specifications

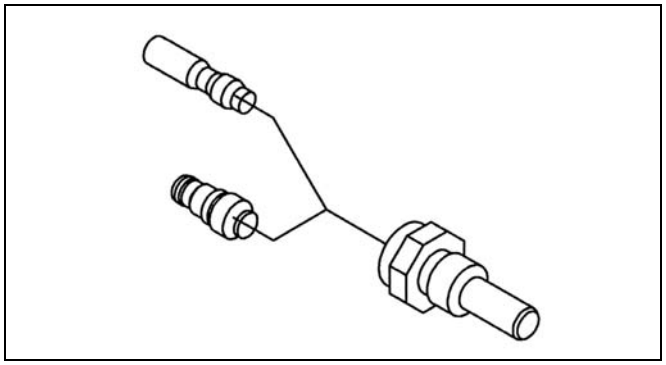
Coil Resistance (WHT/YEL to RED)	15Ω +/- 15% @ 68°F (20°C)

©2010 Polaris Sales Inc.

Knock Sensor



600HO Coolant Temperature Sensor



Sensor Specifications

Operating Temperature Range	-22°F - +248 °F (-30°C - 120°C)
Resistance	2.4 - 2.6KΩ@ 68°F (20°C) (Measure in stirred water)
Installation Torque	29 ft.lbs. (39.2Nm)

Oil Level Sender

To test the oil level sender, position the sender as it would be in the oil tank. Allow the float to drop in the direction it would if the oil tank were empty. Continuity should be present when using a multimeter to test the sender with the float in the “empty” position.

No continuity should be present when the float is moved away from the “empty” position.

Throttle Position Sensor (TPS)

The TPS is located on the carburetor rack. The TPS is set at the time of manufacture and should only require adjustment when:

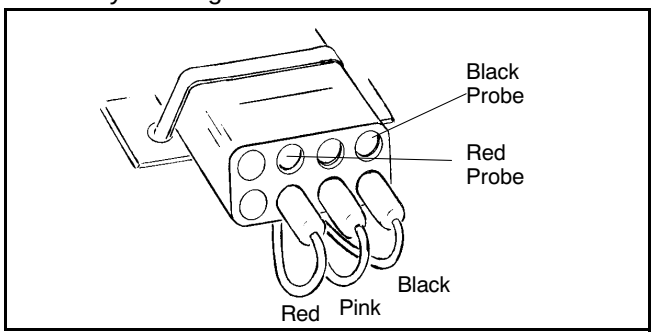
- When the TPS is replaced.
- When the carburetor rack or throttle body is replaced or adjusted.
- The TPS is suspected of being set incorrectly as part of troubleshooting.

The TPS test tool, PN 2201519, is used to accurately adjust the TPS return signal settings.

TPS Test Tool Setup

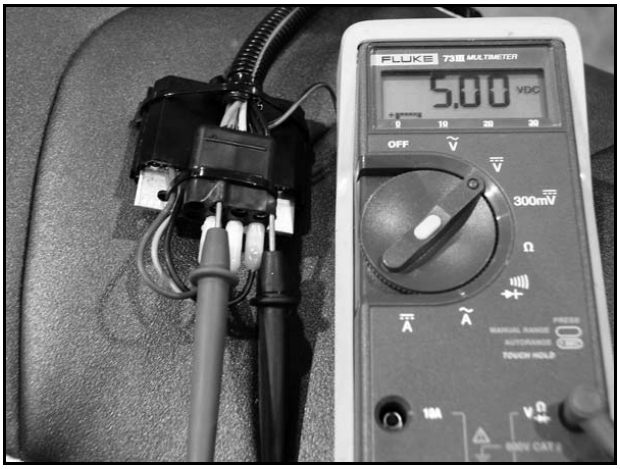
NOTE: Signal readings can be affected if the 9 volt battery is weak. Always verify the battery is in good condition.

1. Set the multimeter to read VDC.
2. Verify the 9 volt battery condition by inserting the black multimeter probe into the black wire terminal and the red multimeter probe into the pink wire terminal. Voltage should read 4.99 to 5.01 VDC. Use a new battery if voltage is below 4.99 VDC.



3. Connect the test tool to the TPS on the carburetor or throttle body.

9922854 - 2007-2011 IQ Service Manual
©2010 Polaris Sales Inc.



NOTE: Always disconnect the 9 volt battery when tool is not in use.

Using the TPS Test Tool

1. Remove the wiring harness connector from the TPS.
2. Verify the throttle cable is not kinked and the throttle flipper is closed. Disconnect the throttle cable from the throttle flipper.
3. Connect the test tool to the TPS.
4. Insert the black multimeter probe into the black terminal port, then insert the red multimeter probe into the yellow terminal port.
5. Reference the specifications to determine if the TPS requires adjustment or replacement.
6. Reconnect the throttle cable with throttle flipper.

TPS Setting Specifications

ENGINES	VOLTAGE SETTINGS
Carbureted Engines	4.00 +/- 0.1 VDC @ WOT

7. To verify the TPS is sending a linear signal, slowly move the throttle flipper from the closed to WOT position, then back down to the closed position.
8. The voltage readings should rise and fall without erratically jumping from high to low.

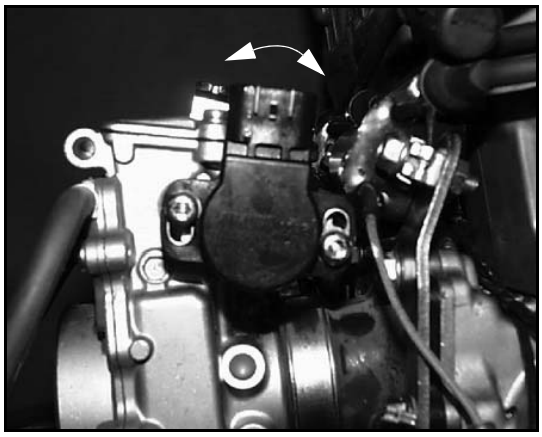
NOTE: The multimeter display may change scales and show O.L. momentarily when throttle flipper is moving.

9. If the signal readings are erratic, replace the TPS sensor.

TPS Adjustment

NOTE: Always verify the engine idle speed is set at engine operating temperature and the throttle cable freeplay is set to 0.10″ - 0.30″.

1. Connect the TPS test tool to the TPS.
2. Slightly loosen the screws securing the TPS to carburetor body.
3. Have an assistant hold the throttle flipper in the WOT position.
4. Turn the TPS **clockwise** to decrease voltage, or **counterclockwise** to increase voltage.
5. Carefully tighten the TPS screws when the WOT VDC is 4.00VDC.

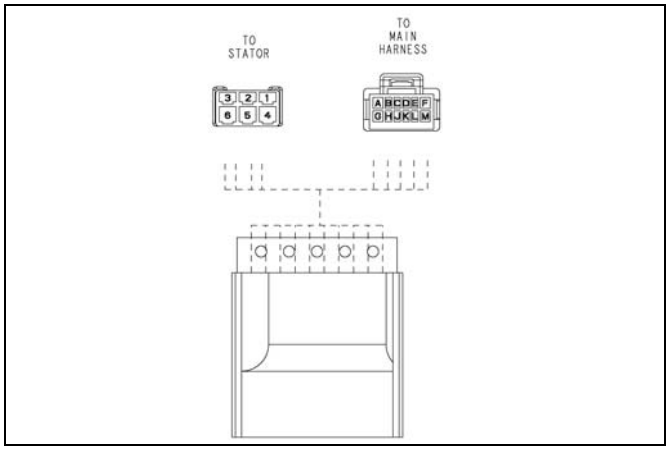


2007 600 HO Regulator / Rectifier

This regulator / rectifier performs the following functions:

- Regulates AC Voltage to 14.3 volts.
- Provides regulated DC voltage to power the MFD gauge.
- Provides regulated DC voltage to charge the battery, if equipped.
- Illuminates the MFD brake LED indicator by grounding the MFD circuit whenever the module receives an VAC brake light signal (operator pulls brake lever).

©2010 Polaris Sales Inc.



Circuit Specifications

PLUG / PIN / COLOR	FUNCTION
STATOR / 2 / BROWN	GROUND
STATOR / 3 / YELLOW	AC POWER INPUT
STATOR / 4 / BROWN	GROUND
STATOR / 6 / YELLOW	AC POWER INPUT
HARNESS / A / YELLOW	REGULATED AC POWER
HARNESS / B / ORG/BLK	DC BRAKE LAMP GROUND
HARNESS / C / ORANGE	AC BRAKE SIGNAL INPUT
HARNESS / D / BRN/WHT	DC GROUND
HARNESS / F / BROWN	AC GROUND
HARNESS / G / YELLOW	REGULATED AC POWER
HARNESS / J / RED/WHT	REGULATED DC MFD POWER
HARNESS / K / RED	REGULATED DC BATTERY POWER
HARNESS / M / BROWN	AC GROUND
METAL TAB	GROUND PLATE

Replace the regulator / rectifier whenever the following occurs:

- AC voltage is over 14.8 volts when the engine is running.
- No DC voltage found on the RED/WHT or RED circuits when the engine is running.
- The brake lights illuminate when the brake lever is pulled, but the LED indicator does not.

2008 RMK Shift 155 Regulator / Rectifier

The RMK Shift regulator / rectifier performs the same functions as the 2007 600 HO regulator / rectifier.

Circuit Specifications

PLUG / PIN / COLOR	FUNCTION
1 / YEL/BLK	AC POWER INPUT
2 / YEL/BLK	AC POWER INPUT
4 / RED	VDC (BATTERY CHARGE)
5 / RED/WHT	VDC (REGULATED FOR MFD)
6 / ORANGE	AC BRAKE SIGNAL
7 / YELLOW	REGULATED VAC
8 / YELLOW	REGULATED VAC
9 / BROWN	GROUND
10 / BROWN	GROUND
13 / BRN/WHT	DC GROUND
14 / ORG/BLK	DC BRAKE LAMP GROUND (MFD)
15 / BROWN	AC GROUND
16BROWN	AC GROUND

2008-2009 IQ Shift 121 Regulator / Rectifier

The regulator rectifier on a 2008-2009 IQ Shift 121 limits AC Voltage to 14.3 volts. The module also supplies 12 VDC to power the exhaust valve solenoid.

Replace the regulator / rectifier if the AC Voltage is above 14.8 V or when there is no 12 VDC supply on the RED / GREEN circuit.

Circuit Specifications

PLUG / PIN / COLOR	FUNCTION
YELLOW	REGULATED 14.3 VAC POWER
RED/GREEN	EXHAUST VALVE SOLENOID POWER (VDC)
BROWN	GROUND

©2010 Polaris Sales Inc.

DETONATION CONTROL (DET)

Overview

Detonation control is achieved by using a knock sensor mounted to the cylinder head and an ECU (CFI engines) or the CDI (600HO carbureted engines).

The knock sensor “listens” for combustion knock by converting internal engine noise in to an electrical signal. The ECU or CDI uses the signal to determine the level of knock within the combustion chambers after each combustion event.

When the ECU or CDI determines detonation has occurred, the CHECK ENGINE / DET LED lamp will blink on and off at 0.5 second intervals.

On CFI models, the ECU will retard timing and provide additional fuel to eliminate the detonation. On carbureted engines, the CDI will retard timing until the detonation stops. If the detonation continues past a pre-determined level, the ECU or CDI will initiate an engine mis-fire mode.

To prevent detonation, follow these steps:

- Always use premium fuel (91, 92, or 93 octane)
- On carbureted engines, follow the carburetor jetting guidelines
- Do not modify the engine or exhaust system with non-approved Polaris modifications
- Verify there is no water or foreign material in the fuel
- Verify there is no internal engine damage
- Verify the cooling system is working properly

NOTE: Install the knock sensor fastener clean and dry without applying thread locker or oils.

VARIABLE EXHAUST SYSTEM (VES)

Overview

The Polaris VES system uses exhaust valves (1 per cylinder) to control the exhaust port height. The valves are actuated by controlling cylinder pressure with a solenoid, bellows, and a series of hoses.

At idle speed and up to a pre-determined level, the solenoid is powered by the ECU or CDI. This action opens the solenoid’s internal valve and allows the cylinder pressure to vent into the atmosphere. During this time the valves are down.

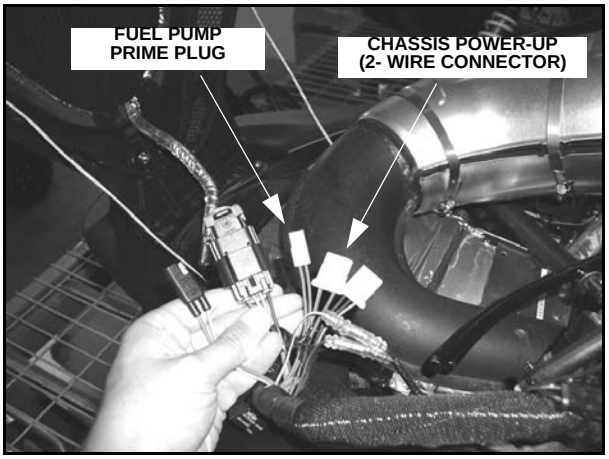
To raise the valves, the ECU or CDI will cut power to the solenoid which will close the vent path to atmosphere. The cylinder pressure will then act upon each valve bellows which will raise each valve.

On CFI engines the timing at which the solenoid is turned off is determined by engine RPM, TPS position, and pipe temperature. On carbureted engines, the CDI will turn the solenoid off at 6700 RPM when the throttle flipper is at least 3/4 throttle or at 7200 RPM when the throttle flipper is at least 1/2 throttle.

NOTE: Solenoid Powered = Vent Path Open
Solenoid Off = Vent Path Closed

9922854 - 2007-2011 IQ Service Manual
©2010 Polaris Sales Inc.

DIAGNOSTIC PLUGS



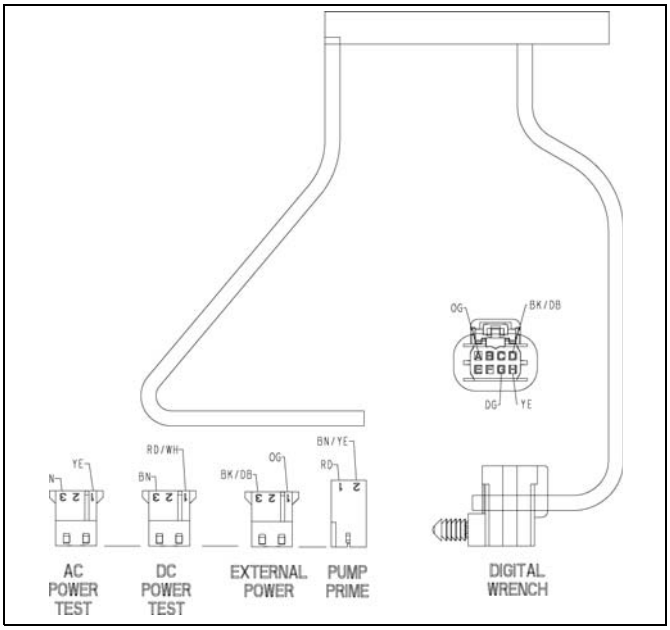
Carbureted / CFI Chassis Power Plug

IQ models (CFI and carbureted) feature a chassis power diagnostic plug. Connect the plug to the M-10 ACE / ECU-Chassis Power-Up cable, PN PA-46355 and a fully charged 12-volt battery. The plug consists of two wires (BRN and RED/WHT).

Once powered, all of the RED/WHT chassis power circuits will be powered with battery voltage. The circuits include:

- Head / Tail / Brake Lamps
- MFD (Multi Function Display)
- Accessory Power Plugs
- Hand / Thumb Warmers

DC-CFI DC Power Test Plug



DC-CFI models feature DC power test diagnostic plug. Connect the plug to the M-10 ACE / ECU-Chassis Power-Up cable, PN PA-46355 and a fully charged 12-volt battery. The plug consists of two wires (BRN and RED/WHT).

Once powered, all of the RED/WHT chassis power circuits will be powered with battery voltage. The circuits include:

- MFD (Multi Function Display)
- Accessory Power Plugs

CFI / DC-CFI Fuel Pump Prime Plug

CFI / DC-CFI models feature a fuel pump prime plug. Use the fuel pump prime plug to power-up the fuel pump when purging the fuel system of air or when testing fuel pump pressure.

The fuel pump prime plug consists of two wires. (BRN and RED) for CFI models and (RED and BRN/YEL) for DC-CFI models.

©2010 Polaris Sales Inc.

ELECTRONIC REVERSE (PERC)

Overview

Some models are equipped with Polaris electric reverse control (PERC). The operation of the electronic reverse system is achieved by automatically reversing the engine rotation with a push of a button. When in reverse you will have an indicator light that will flash, notifying you that the machine is in the reverse mode. The design of the clutches are matched to the specifications that will allow the backwards rotation of the engine to move the sled in reverse. To get back to forward is as easy as pushing the button again.

Operation

⚠ WARNING

Reverse operation, even at low speeds, may cause loss of control, resulting in serious injury or death. To avoid loss of control, always:
LOOK BEHIND BEFORE AND WHILE BACKING.
AVOID SHARP TURNS.
SHIFT TO OR FROM REVERSE ONLY WHEN STOPPED.
APPLY THROTTLE SLOWLY.

⚠ CAUTION

To avoid personal injury and/or engine damage, do not operate the electric start or recoil while engine is running.

1. Ensure that the vehicle is stopped and the engine is warmed up and running at idle.

NOTE: ***The system will only engage in reverse if the engine is below 4000 RPM. If engine is above 4000 RPM the system can not be activated.***

2. Ensure that the path behind you is clear.
3. Push and hold the yellow reverse button on the left hand control for 1 second and then release the button. The reverse light on the instrument panel will flash when engine is in reverse motion.

NOTE: ***The engine will automatically reduce RPM and it will reverse the rotation of the engine when the RPM is at the lowest RPM point.***

4. Ensure that the path behind you is clear.
5. Slowly apply throttle until the sled starts to move in reverse, and carefully direct the sled in the direction that you want.

NOTE: ***Maximum RPM in reverse is 6000 RPM.***

NOTE: If the engine stops running or is shut off while in reverse. The engine will start in forward gear.

FORWARD OPERATION

1. If unit was operated in reverse, ensure that the path ahead is clear, and push an hold the reverse button for 1 second and then release the button. The engine will now automatically change direction form reverse to forward and the reverse light on the instrument panel will stop flashing.

NOTE: ***When servicing clutches, ensure that the vehicle is in forward gear. If not damage to the driven clutch may occur when removing the belt.***

Altitude Setting

If your engine is carbureted, you can adjust the elevation setting of the Polaris electric reverse control (PERC). If your engine is a Cleanfire system, this is automatically done through the engine controller unit (ECU), and you do not need to do any setting.

At higher elevations over 6000 feet (1829m), the engine requires a different ignition RPM setting to improve the operation of the reverse system.

To set the altitude settings:

1. With the engine running, push and hold the reverse button for 5 - 6 seconds and then release the button.
2. The reverse light will flash rapidly on the instrument panel.
3. You have now set the PERC system to the higher elevation setting.
4. To go back to the low elevation setting repeat step 1. The reverse light will flash slowly indicating that the system is now in the lower elevation setting.

NOTE: ***The elevation setting will be set in the memory (engine running or not) until it is changed.***

©2010 Polaris Sales Inc.

Important Notes

- Max RPM for shifting into reverse = 4000 RPM
- Max RPM for operating in reverse = 6000 RPM
- Engine must first reach 900 RPM at start up before the reverse system can be used. The system works between 900 and 4000 RPM.
- If the button is pushed above 4000 RPM the system is bypassed and nothing will happen.
- Flashing light on the instrument panel indicates that the system is in reverse. On carbureted units a slow flash indicates that the system is set for low elevation, and a fast flash indicates the system is set up for high elevation. Push and hold the reverse button for longer than 5 seconds to toggle back and forth from high and low elevation settings. On Cleanfire units this is automatically done through the engine controller unit (ECU).
- Elevation above 6000 ft (1829m) requires a different timing curve to eliminate a “kick-back” effect.
- If engine is shut off or dies in forward or reverse gear, the engine when started will automatically be in forward gear.
- When servicing clutches, ensure that the vehicle is in the forward gear.
- On CFI and DC-CFI models the PERC system will not operate if the TPS is out of adjustment or the 5 tooth CPS signal is interrupted or broken.

9922854 - 2007-2011 IQ Service Manual
©2010 Polaris Sales Inc.